Railway Age

DAILY EDITION

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EDITORIAL

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There are many difficulties to be overcome by committees in carrying their work to a successful conclusion. Probably as great a problem as any is that of deciding definitely, when standard practice is to be recommended to the convention, what shall be the scope of the report. There is always the possibility, in arriving at this decision, of flying too high or too low. If the first is the case, the recommendation becomes theoretical and the man seeking guidance becomes discouraged when he finds that the suggestions cannot be applied to his difficulties in a practical manner. It is obvious that the results of the second alternative are even worse. The association is to be congratulated on the fact that the reports submitted are so universally free from either of these extremes.

Difficulties of Report Making

One of the most formidable problems ever imposed on this association was the establishment of standards for what we are wont to call "clearance diagrams" for roadway structures. Difficulties have been encountered largely through a lack of co-ordination of the work of this and other organizations of railway men. Thus there are clearance diagrams for bridges and buildings, for third rails and for clearance diagrams for locomotives and cars, each without any relation to the other. As a result the real "clearance"—the actual space between the outside limits of the rolling stock and the nearest projection on the adjacent roadway structures—is a rather indefinite quantity, when, as a matter of fact, it is this clear space that is so important. Is not this objectionable condition caused in part by the inadequacy of the present terminology? "Clearance diagram" does not adequately express what we have in mind. A "limiting dimensions" diagram is awkward and does not express the full meaning. Some better term should be evolved.

What Do We Mean by Clearance

The strenuousness of the times through which we have been passing during the past year has been reflected in the committee work of the American Railway Engineering Association. The withdrawal of many men from civil into military service has deprived the committees of their services while the demands made upon the time of those remaining at home have been so many and so urgent as to curtail their activities. As a result, the excellent reports which many of the committees have prepared have been due to unusual efforts. It was the experience of several committees that it was necessary to curtail the number of subjects reported on, while in at least three or four instances little or no progress was reported. Now that the war has ended, and the members of the association in military service are returning rapidly to their former positions, these handicaps should be removed in a large measure. If the committees to be appointed make as much of their opportunities during the coming year as have those of the present, the association may well look forward to unusually high grade reports at the next convention.

The War and Committee Work

The investigations made by the Committee on Ballast as to the use of reinforced concrete slabs in railroad roadbeds brought out interesting and widely differing opinions from more than 25 chief engineers. While it is true that adverse opinions were expressed by some, the fact that interest was expressed by the great majority is evidence that the studies into this problem should be continued. The use of concrete for this purpose is not new by any means, but its application has been localized largely to tunnels, etc. The investigations, however, indicate its possible adoption for more general use and the conclusions reached by the committee as to its possible field will be received with much interest.

Further Possibilities for Concrete

One element responsible for the eminent success of this convention lies in the fact that C. A. Morse, president of the American Railway Engineering Association, is also the chief engineering officer of the United States Railroad Administration. In the course of the discussion on many of the subjects submitted by the committees on Tuesday there were not infrequent references to various dealings of the Administration with the railroads—matters concerning which there may have been some misunderstanding. Mr. Morse has evinced a happy faculty for explaining the Administration's point of view. In several cases by a straight forward statement, coupled perhaps with one or two homely illustrations, he was able to demonstrate the nature of the problems with which he is confronted as assistant director of the division of operation in a way that has cleared up the difficulties.

C. A. Morse, Director of Maintenance

Railway maintenance men are now facing the problem of Americanization to an extent never before realized. It is becoming evident that the railroads, in justice to themselves, and for the welfare of the country as a whole, must do their share in helping the foreigner to gain a real conception of American ideals and to enroll him as a substantial and creditable citizen. The events of the past three years have awakened the nation to the vital necessity of doing this and of the grave danger of neglecting the foreigners among us and allowing them to live by themselves, and according to the traditions and ideals of their native countries—ideals which in many instances are at direct variance with those of this nation. The

The Americanization Program

seriousness of the problem has been emphasized in no uncertain manner since the world war started in 1914, but the danger is that the necessity of improving conditions in this respect will be overlooked and forgotten, now that active warfare has ceased. Many of the large industries have made great strides in Americanizing their foreign-born employees; this they have done from business as well as patriotic motives. It has paid so well in the elimination of friction and misunderstandings, and in the better and more orderly government of the industrial communities in which they are located that they are being encouraged to go forward with still more elaborate plans. The Pennsylvania railroad has made excellent progress with its schools for Italian and other foreign-speaking employees and with its instruction in better citizenship; the results have been worth while and other roads can well afford to develop similar programs.

A Service to the Country

THE YARDS AND TERMINALS COMMITTEE rose to the occasion in a splendid manner last summer when it prepared and issued several reports of timely value for immediate use. That on unit operation of terminals in large cities was of special service at the time when the Railroad Administration was endeavoring to co-ordinate such facilities in order to increase their effectiveness and capacity for the handling of the tremendous traffic of the country at a time when delay in the movement of a large proportion of the business could not be tolerated. The preparation of a series of fundamental principles by this committee whose members had given this subject special consideration for a considerable time, was highly valuable to men who had the new problem thrust upon them with little chance for preparation. The association published this report as soon as it was available. It can well afford to follow the same practice with respect to reports of other committees whenever early need for the information arises. The association can be of the greatest value to the railway industry by giving first consideration to the problems of greatest importance, and then by making the results of its investigations available at the earliest practical date.

More Work to Be Done

THE A. R. E. A. IS NOW twenty years old and has brought forth more than a "three-foot bookshelf" of proceedings, bulletins and manuals during the two decades of effort. In view of these results it has been questioned whether there is enough work left to keep twenty or more committees busy for the next twenty years. After listening to yesterday's discussions the answer is unreservedly—yes. The discussion of the Tie Committee's report on screw spikes is a most eloquent confirmation of this view. Mr. Ray's lucid demonstration of the excellent results secured with screw spike track construction as opposed to the data accumulated by the committee and as borne out by the extended investigation made by officers of the Pennsylvania, goes to show that there are two schools of thought on this subject, each group being equally sincere in its views. In scientific matters such a divergence of opinion is not the result of prejudice, but shows a lack of complete data or a failure to appreciate the full significance of all the evidence at hand. More time and further study are necessary for an adequate correlation of the facts that will permit a sufficiently accurate analysis to disclose the real truth. Such matters as these will keep the association busy for many years to come.

Mr. Hooley on the Coliseum Exhibit

By F. W. Lane

"TH' EXYBIT at th' Collyseeum 's ixciptionally good this year," casually remarked Mr. Hooley as he wiped off the bar and noticed that he was alone with his parasitic friend Dennissey.

"Exybit, what it is?" inquired Dennissey, desirous as ever of showing Mr. Hooley that species of gratitude which is a lively expectation of favors yet to come. "Ye towld me th' other day that Barnum & Bailey and Ringling's was consollyda-ated. 'S th' show at th' Collyseeum agin now?"

" 'Tis no circus, Dinnissey, iv we ixcipt th' times when two min riprisinting compating lines are manoeuvrin' t' atthract th' fav'rable attintion av th' same man t' th' matarial they've got on exybition," replied Mr. Hooley, reflectively.

"No, Dinnissey, 'tis th' exybit av relrod thrack supplies that th' ingineers that's havin' a convintion at th' Congress hotel are supposed t' be inthrusted in, 'nd some of thim do go t' say it, iv they don't have nothin' better to do. 'Twould pay ye t' git a tickut fr'm somebody that wud take ye f'r a thrack man 'nd go down 'nd see ut. 'S I towld ye tin years ago on a sim'lar occasion, ye might be able t' tell a simmyfor fr'm a watherspout, or a whalebarrow fr'm a hand car. But ye cud shine in discussin' th' merits av th' picks 'nd shovels, f'r, 's far's my knowledge goes, them's th' only tools ye've more thin a passin' acquaintance wit'.

"I wudn't advise ye t' thry t' get int' th' inthricacies av th' signal systems, f'r that ye'er knowledge av such things, as dishplayed by ye whin I was tillin' ye about th' signal min indicates t' me obsarvin' mind that there's manny things thats beyant th limmuts av ye'er philosophy, Horatio, t' quote me frind th' bard av Avon agin. But they's switches 'nd frogs—not th' kind ye eat the ligs av—'nd iverything th' relrod min use on th' right av way, ixcipt dagoes.

"But I stharted in t' till ye why th' exybit this year's betther than iver before. Ye see, 'tis this way: F'r siv-ral years th' relrods 've bin too poor to spind money on such things as kapin' th' thrack in first class shape, or iv they've had th' money they had to spind it in kapin' up th' wages av th' other departmints. Ye mind what I've towld ye about th' raises in wages av th' injinemin 'nd firemin. Will, ye see, iv th' relrods don't have money to spind f'r thrack maintenance they don't buy thrack tools, 'nd thrack supplies, 'nd that, I asshume, is wit'in ye'er comprehinsion. So th' manufacturin' companies that's riprisinted at th' Collyseeum exybit have had time t' get up new 'nd timptin' appli'nces—that's what they call thim, relrod appli'nces—'gainst th' time whin th' roads begin again t' buy thim.

"It shtands t' rayson, Dinnissey, that th' thrack can't go on foriver wit'out some woruk bein' done on it, whither th' guv'mint kapes th' roads or not. F'r that rayson, iv f'r no other, th' min that make th' tools th' relrods ought to use have got together a fine colliction. 'Tis a grea-at show, Dinnissey.

" 'Tis th' time now, Dinnissey," observed Mr. Hooley, reflectively, by way of a snapper to his previous observations, " 'tis th' time now f'r arl good min t' come t' th' aid av the parthy. Only, Dinnissey, th' parthy an't th' wan that ginerally nades our assishtance. 'Tis th' thrue pathrite that putts th' good av his counthry above mere parthy consid'rations. Now whin we've licked th' Boshe, th' thrue pathrite's thryin' t' hilp th' counthry out av th' hole th' Boshe got it into, 'nd wan av th' bist ways to do

us is t' hilp th' relrods get on their bote fate. D'ye get my manin', Dinnissey?"

"Wud ut hilp anny iv I go t' the Collyseeum?" inquired Dinnissey, with some show of feeling.

"It might show ye've got some pathriotic spirrut in ye, as well's th' other kind," answered Mr. Hooley, pushing forward the tools of his trade.

Automatic Train Control Committee on Western Trip

THE AUTOMATIC TRAIN CONTROL COMMITTEE, appointed by the Railroad Administration on January 14 to investigate devices for automatically stopping a train in the event of failure of the engineer to obey signal indications, and so far as possible when the signal fails to indicate a condition requiring a stop, is beginning this week a trip to inspect several such devices which have been installed on western railroads, with a view to making recommendations to the Railroad Administration for further installation on a large scale of such devices as it deems practicable. The committee will leave Chicago Friday afternoon to inspect on Saturday the operation of the Miller Train Control System in service on the Chicago & Eastern Illinois between Chicago and Danville, Ill., and it will again leave Chicago on Sunday for Spokane, Wash., for an examination of an automatic stop on the Washington Water Power Company's railway. Thence it will proceed to San Francisco, where such a device is in service on the line of the Key Route Electric Railway, and to Oroville, Calif., where an installation has been made on the Western Pacific. Later it will look at other devices on eastern roads, including one in service on the Chesapeake & Ohio.

The committee's instructions from the Division of Operation of the Railroad Administration were "to proceed at once to make a study of, and report upon, the automatic train control devices now undergoing test upon various lines of railroad or available for test, with their recommendations for the installation and further practical test of any devices now or during their investigation made available for that purpose, which they may consider practicable and reasonably conforming to the purposes to be accomplished. The report of the committee will include recommendations upon the requisites of automatic train control and conclusions upon the mechanical or economic features of such of the devices as the committee may find available for practical use."

The Chicago & Eastern Illinois was a pioneer in the development of an automatic stop and now has the most extensive installation of the kind in the country. It has been in regular and satisfactory operation on the double track line from its Dolton Yard, in Chicago, to Danville, a distance of 106 miles, since the fall of 1914, after 3 or 4 years had previously been spent in experimenting, testing and developing the train control system. During the 4 years since the device was put in regular service particular attention has been given to perfecting its operating efficiency under all weather conditions and service requirements.

The first action of the Automatic Train Control Committee was to draw up a list of requisites for the design and construction of an adequate automatic train control system and at its meeting in Washington the committee passed on about 250 plans for automatic train control devices submitted to it, most of which had previously been examined and reported on by the Interstate Commerce Commission. After an examination of the plans the committee has eliminated all but 36 of the devices as not meeting the requirements, and it is now concentrating on those that have proven their merit in service or which are regarded as worthy of more careful consideration, with a view to selecting one or more different types for further practical test.

The chairman of the committee is C. A. Morse, formerly chief engineer of the Chicago, Rock Island & Pacific at Chicago, now assistant director of the Division of Operation of the Railroad Administration and president of the American Railway Engineering Association. The other members are W. P. Borland, chief of the Safety Bureau of the Interstate Commerce Commission; C. E. Denney, assistant to the federal manager of the New York, Chicago & St. Louis; H. S. Balliet, signal engineer, electric division of the New York Central; Henry Bartlett, chief mechanical engineer, Boston & Maine; J. H. Gumbes, general superintendent of the Western Pennsylvania grand division of the Pennsylvania Railroad, and R. W. Bell, general superintendent of motive power of the Illinois Central. G. E. Ellis, heretofore signal engineer of the Interstate Commerce Commission, is secretary. The members of the committee are attending the convention.

Today's Program

The program of the American Railway Engineering Association convention for today is as follows:

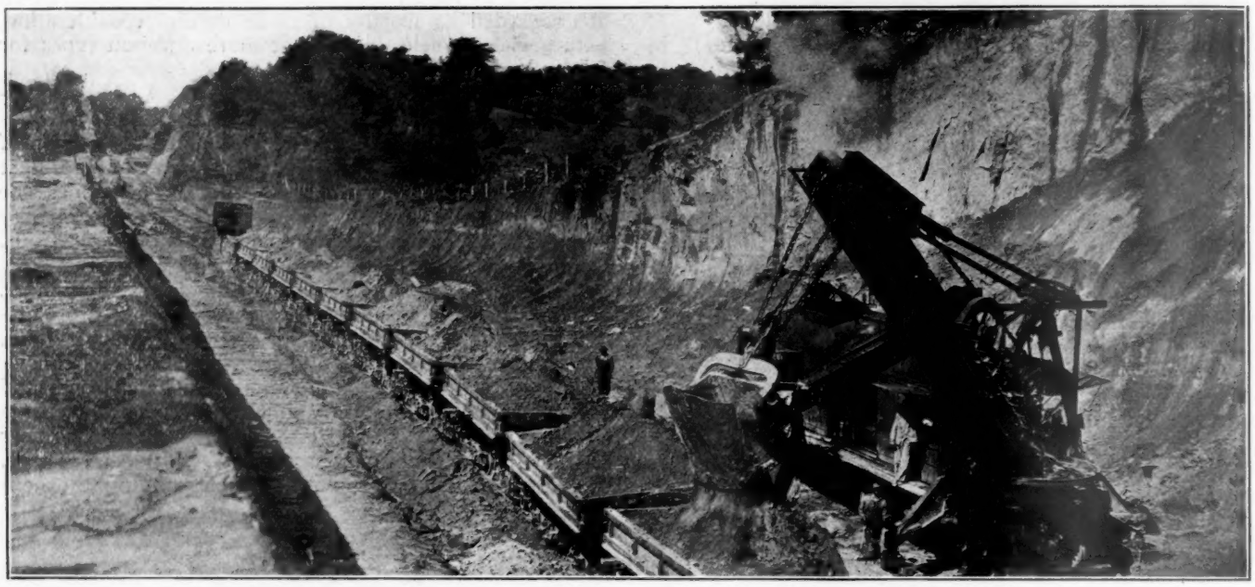
Iron and Steel Structures.
Masonry.
Water Service.
Wooden Bridges and Trestles.
Uniform General Contract Forms.
Economics of Railway Operation.
Economics of Railway Location.

Pennsylvania Railroad Recognizes A. R. E. A.

For the first time in the history of the American Railway Engineering Association, the Pennsylvania Railroad has sent a number of its officers to attend the meeting. Thirteen officers of the maintenance of way department arrived yesterday morning to spend several days in attendance at the conventions and the exhibit at the Coliseum. While officers of this road have attended the meetings in past years, they have done so as individuals and without official instructions; this year they are here under orders from their superior officers. Those composing the general managers' committee representing the Pennsylvania Railroad, Lines East, at the convention include: J. B. Baker, supervisor, general managers' office; J. C. Auten, principal assistant engineer, Southern division; J. H. Harris, principal assistant engineer, New Jersey division; G. H. Brown, principal assistant engineer, Eastern Pennsylvania division; J. O. Hackenberg, division engineer, Maryland division; T. J. Skillman, division engineer, New York division; H. H. Garrigues, division engineer, Philadelphia terminal division; J. H. Reading, division engineer, Middle division; E. B. Wiseman, division engineer, Buffalo, division; E. J. Ayars, division engineer, Williamsport division; C. W. Richey, assistant division engineer, Pittsburgh division; J. M. Fair, supervisor engineer maintenance of way office, and George Ehrenfeld, supervisor, Pittsburgh division.

Japanese Officer Visits Convention

Baron Chuzo Mori, civil engineer with the Imperial Government Railways of Japan, with headquarters at Tokio, Japan, and temporarily stationed at New York City, has been an interested attendant at the convention and the exhibit at the Coliseum.



American Railway Engineering Association Proceedings

A Report of Wednesday's Sessions Including Presentation of Nine Committee Reports With Discussions

THE SECOND DAY'S SESSION of the convention of the A. R. E. A. was called to order at 10 o'clock by Vice-President Stimson in the absence of President Morse, who was confined to his room by illness. The room was unusually well filled throughout the entire day. Reports were presented by the committees on Wood Preservation, Yards and Terminals, Electricity, Ties, Stresses in Railroad Track, Buildings, Ballast, Roadway and Rail. These reports and the discussion which they brought out are given below.

Report of Committee on Wood Preservation

IN APPENDIX A the committee submits changes and additions on the following items and recommends their adoption under the heading of Conclusions.

(a) Revised specifications for creosote oil.

(b) Revised specification for creosote-coal-tar solution.

(c) Revised title to include creosote-coal-tar solution with creosote oil under methods for determining absorption.

(d) Revised wording and fuller details in the analysis of creosote oil.

(e) Revised specification for zinc chloride.

(f) New specification covering the method for determining the strength of zinc chloride solution.

In Appendix B the committee submits information concerning creosoted water tanks. The committee also submits the results of a very thorough investigation of the Burnettizing treatment and submits for information general conclusions relative to the value of zinc chloride and creosote oil and a mixture of the two. It submits a revised specification for the treatment of ties by the Burnettizing process, which is recommended for adoption under the heading of Conclusions.

In Appendix C, the committee submits as information an improvement of the Bateman method as proposed by the Forestry Service.

The committee reports progress on subjects (3) Water gas tar as a preservative; (4) Uniformity of practice and specifications with other associations; (5) Douglas Fir preservative treatment.

Conclusions

The committee makes the following recommendations to the Association:

FOR ADOPTION AND PUBLICATION IN THE MANUAL

1—(a) Proposed revision of specifications for creosote oil.

(b) Proposed revision of specification for creosote-coal-tar solution.

(c) Proposed revision of title to include creosote-coal-tar solution with creosote oil under methods for determining absorption.

(d) Proposed revision of wording and fuller details in the analysis of creosote oil.

(e) Proposed revision of specification for zinc chloride.

(f) Proposed specification covering method for determining the strength of zinc chloride solution.

2—Proposed revision of specification for treatment of ties by the Burnettizing process.

Accept as Information

Report on the creosoting of water tanks.

Report on the question of the treatment of ties with zinc chloride and the general recommendations and conclusions in connection therewith.

Report covering improved method for determining visually the penetration of ties treated with zinc chloride.

Recommendations for Future Work

Your committee recommends for next year's work the continuation of the subjects now assigned, and as new subjects:

(1) Availability and use of sodium fluoride as a preservative for cross-ties.

(2) Creosote treatment to be used in the protection of piles in teredo infested water.

Committee: C. M. Taylor (P. & R.), chairman; Dr. Hermann von Schrenk (Cons. Timber Engr.), vice-chairman; F. J. Angier (B. & O.), F. L. C. Bond, E. H. Bowser (I. C.), W. A. Fisher, C. F. Ford (C. R. I. & P.), C. J. Graff (N. Y. C.), R. H. Howard (Wab.), C. H. R. Howe (B. & O.), J. E. Johnson (M. C.), G. E. Rex (A. T. & S. F.), Lowry Smith (N. P.), O. C. Steinmayer (S. L. & S. F.), H. Stephens, E. A. Sterling, C. H. Teesdale (Forest Products Lab.), J. H. Waterman (C. B. & Q.).

Appendix A—Revision of Manual

A joint committee consisting of representatives of the Preservative Committee of the American Wood-Preservers' Association and of this committee conducted a further investigation on the question of "Water in Creosote" with special reference to the water content of oil shipped in tank cars and the sampling of such cars before being unloaded. The work to date strengthens our belief that the Zone Sampling Method, adopted as standard practice (see Vol. 18, A. R. E. A. Proceedings, page 1271), is correct in principle, but that it needs a further refinement for actual application. The committee suggests that this co-operative work be continued until the method is definitely determined for all conditions.

The committee, after a study of the specifications for creosote oil and creosote-coal-tar solution, finds that the specifications adopted in 1912 should be revised. This revision is necessary because increased safe-guards have been developed for enforcing the specifications. The specifications herewith recommended are the result of several years' work of committees of the American Railway Engineering Association, American Wood-Preservers' Association and American Society for Testing Materials. The three revised specifications differ from the specifications now printed in the Manual only in the addition of certain clauses to make the specifications more workable.

Standard Specification for Creosote Oil

The oil shall be distillate of coal-gas or coke-oven tar. It shall comply with the following requirements:

1. It shall contain not more than 3 per cent of water.
2. It shall contain not more than 0.5 per cent of matter insoluble in benzol.
3. The specific gravity of the oil at 38 deg. /15.5 deg. C. shall be not less than 1.03.
4. The distillate based on water-free oil, shall be within the following limits:

Up to 210 deg. C. not more than 5 per cent.
Up to 235 deg. C. not more than 25 per cent.

5. The specific gravity of the fraction between 235 deg. C. grade and 315 deg. C. shall not be less than 1.03 at 38 deg. /15.5 deg. C.

The specific gravity of the fraction between 315 deg. C. and 355 deg. C. shall not be less than 1.10 at 38 deg. /15.5 deg. C.

6. The residue above 355 deg. C., if it exceeds 5 per cent, shall have a float test of not more than 50 sec. at 70 deg. C.
7. The oil shall yield not more than 2 per cent coke residue.
8. The foregoing test shall be made in accordance with the standard methods of the American Railway Engineering Association.

In addition to the oil conforming to the above standard specification, the two grades specified below may be used when the higher grade oil cannot be procured. The specifications are the same as the standard except as noted below.

Specification for Grade 2 Creosote Oil

4. The distillate, based on water-free oil, shall be within the following limits:

Up to 210 deg. C. not more than 8 per cent.
Up to 235 deg. C. not more than 35 per cent.

Specification for Grade 3 Creosote Oil

4. The distillate, based on water-free oil, shall be within the following limits:

Up to 210 deg. C. not more than 10 per cent.
Up to 235 deg. C. not more than 40 per cent.

It is urged that when Grades 2 or 3 are used, consideration be given to the injection of a greater quaitity of creosote oil per cubic foot.

Specification for Creosote-Coal-Tar Solution

The oil shall be a coal-tar product, of which at least 80 per cent shall be a distillate of coal-gas or coke-oven tar, and the remainder shall be refined or filtered coal-gas or coke-oven tar. It shall comply with the following requirements:

1. It shall contain not more than 3 per cent water.
2. It shall contain not more than 2 per cent of matter insoluble in benzol.
3. The specific gravity of the oil at 38 deg. /15.5 deg. C. shall not be less than 1.05 nor more than 1.12.
4. The distillate, based on water-free oil, shall be within the following limits:

Up to 210 deg. C. not more than 5 per cent.
Up to 235 deg. C. not more than 25 per cent.

5. The specific gravity of the fraction between 235 deg. C. and 315 deg. shall not be less than 1.03 at 38 deg. /15.5 deg. C.

The specific gravity of the fraction between 315 deg. C. and 355 deg. C. shall be not less than 1.10 at 38 deg. /15.5 deg. C.

6. The residue above 355 deg. C., if it exceeds 26 per cent, shall have a float test of not more than 50 sec. at 70 deg. C.
7. The oil shall yield not more than 6 per cent coke residue.
8. The foregoing tests shall be made in accordance with the standard methods of the American Railway Engineering Association.

The committee recommends that the precaution pertaining to inspection and precautions in the use of the creosote-coal-tar solution, as now appearing in the Manual, be changed to read as follows:

Precautions to Be Followed in the Purchase and Use of the Creosote-Coal-Tar Solution

1. The specifications for a creosote-coal-tar solution are submitted for the guidance of those desiring to use the coal tar addition to creosote.
2. There should be a distinct understanding between all concerned that a mixture is specified and used.
3. The refined coal-tar used shall be subject to inspection or analysis by the railway company at any time, such examination to be permitted upon request prior to the mixing of the solution.
4. In case the railway company makes its own solution of coal-tar and creosote, using crude tar for this purpose, it shall specify clearly as to the quality of the tar. Only low carbon coal-tar should be used, the amount of free carbon not to exceed 5 per cent.
5. The coal-tar may be added to the creosote at treating plants when suitable facilities for properly mixing the solutions are available, otherwise the solution should be mixed by the manufacturer, but subject to the inspection or supervision of the railway company. The coal-tar and creosote should be thoroughly mixed at a temperature of approximately 180 deg. F. before being applied to timber. The mixing should be done in tanks other than the regular working tanks, and the tanks containing the mixture should be heated and agitated thoroughly

each time before any oil is transferred to the working tanks.

6. In treating with the mixture the temperature of the solution in the cylinder should not be less than 180 deg. F.

The committee further recommends that the title on page 548 of the 1915 Manual, dealing with methods for determining absorption, now reading "Methods of Accurately Determining the Absorption of Creosote Oil," be changed to read "Methods of Accurately Determining the Absorption of Creosote Oil and Creosote-Coal-Tar Solution."

Analysis of Creosote Oils

Since the adoption of the revised standard methods for analysis of creosote oil, as printed in the Supplement to the Manual for July, 1917, Bulletin 197, and as a result of co-operative work between committees of this Association, the American Wood-Preservers' Association, and the American Society for Testing Materials, certain slight corrections, changes and additions have been made. The committee recommended that these be embodied in the standard specifications for creosote analysis.

Zinc Chloride

The specification of zinc chloride appearing in the 1915 Manual, page 551, is not present practice. It has been revised to conform with present usage, and it is recommended that the following revised specification be inserted in the Manual:

The zinc chloride shall be acid-free and shall not contain more than 0.1 per cent iron. Fused or solid zinc chloride shall contain at least 94 per cent soluble zinc chloride. Concentrated solutions shall contain at least 50 per cent soluble zinc chloride.

Appendix B—Service Test Records

The committee reported progress on this work and submitted for information this year the work that has been done by the Illinois Central in using creosoted water tanks as its standard. (*Railway Age,* Oct. 18, 1918, page 709.) The committee feels that other railroads could well afford to investigate the matter of creosoting water tanks, as the life of a water tank depends almost entirely on the prevention of rot, and if the tank and supports are properly framed and treated a very long life can be reasonably expected.

The sub-committee was also asked to make "A critical study of the records of service given by the zinc chloride treatment and state definitely the results which may be obtained from that treatment. The question as to what might be expected from treatment with zinc chloride is of very general interest, particularly under the present emergency conditions.

In the following report the committee presents such records as have been found available, together with discussions, and the conclusions drawn from track experience. It has formulated definite recommendations as to methods to be followed in order to obtain the best results with zinc chloride treatment, with general conclusions as to what may be expected of zinc chloride treated ties when treated and used according to these recommendations.

A careful study of the track records and personal conferences with those familiar with the use of zinc treated ties lead to the conclusion that proper treatment will, at least, double the life of an untreated tie in the same situation. The experience of roads which have used zinc chloride treated ties clearly shows that the best results are obtained only when thoroughly sound ties are treated. Undoubtedly, many of the poor results obtained with zinc chloride treated ties were due to the fact that many ties were more or less rotten before they were treated. Decayed timber can never be expcted to give good service. It is frequently stated that ties can be properly seasoned along the right-of-way or where cut, and that any deterioration can easily be detected by careful inspection. It has been demonstrated beyond all doubt that visual inspection of ties several months after cutting is not only impractical but frequently very misleading, because of the internal decay not evident on the outside. The successful preliminary preparation of ties is one of the most vital factors in obtaining successful service, and it is necessary that ties in all stages before treatment be kept in well-ventilated piles, free from every possible kind of infection. To help prevent these conditions, all ties should be shipped promptly after cutting to the seasoning yard at the treating plant. This means that all yards should be kept free from weeds, decayed wood and standing water.

The best results from the use of zinc chloride treated ties can only be obtained when the ties are thoroughly air seasoned before treatment. This calls for carefully constructed tie piles, care being taken to keep the stringers as far out towards the ends of the piles as possible and with sufficient air spaces between the piles.

Careful records should be kept of the ages of the tie piles, for it has been found far better to treat ties on the basis of age rather than on visual inspection. The time necessary to properly air season will vary, but in general the best results have been obtained by seasoning red oak ties twelve months and pine ties about four months.

In order to assure proper information as to the age of ties, the committee finds that some railroads have adopted the admirable system of end-branding the ties as they are taken up by the inspector, with a figure or paint mark, indicating the month of the year in which the ties were cut, which practice we strongly recommend.

The committee finds that the life of zinc chloride treated ties is greatly influenced by geographical factors, conditions of ballast, the amount of traffic, weight of rail, etc. The service obtained is to be ascribed more to these factors than to the kind of timber or the zinc chloride treatment. In other words, while softwoods like pine have generally given shorter service than hardwoods like oak, this difference is due to the fact that the pine ties rail-cut more rapidly than oak, thereby giving an opportunity for water to lodge under the rail bearings and leach out the zinc salt with the consequent more rapid decay of the pine ties.

Climatic influences undoubtedly have a large bearing on the possible length of life. A study of the tables clearly shows that in regions of low rainfall and dry atmospheric conditions, longer life has been obtained than in regions of high rainfall and high humidity. It is also true that the same holds for regions of low mean temperatures as compared with regions of high mean temperatures.

Influence and Treatment.—One of the most striking conclusions obtained, from the study made, is that the quality of treatment has the most direct bearing on the ultimate life obtained. It has been clearly demonstrated that poorly treated ties give short service and well-treated ties give longer service. The committee finds that poor treatment has been caused by: (1.) Excessive steaming of green or partially seasoned ties, in order to obtain any absorption at all. In many cases the absorption even after such steam treatment was very poor. (2.) The injection of an inadequate amount of zinc chloride. (3.) Paying no attention to the relation between the strength of the solution and the duration of pressure, resulting in a large amount of the zinc chloride solution being compacted in the outer layer of wood, when it should have

permeated the entire tie. (4.) The lack of intelligent and thorough supervision.

One of the criticisms of the zinc chloride treatment is that the preservative, being soluble in water, leaches out and, therefore, can not be expected to give permanent protection. A general investigation of the results clearly indicates that the leaching process does not take place as rapidly as has been assumed. We have determined from an examination of ties which have been in the track for a number of years that they still retain zinc chloride well distributed throughout the tie. This is more noticeable in drier climates. The committee finds that while zinc chloride is a water soluble salt, it leaves the wood very slowly and that sufficient is retained in the wood fiber to give protection that will at least double the life obtained from the untreated wood.

One of the results found by actual track inspection is that many zinc treated ties were taken out because of checking. The extent of checking varies with the climate, ballast conditions and the kind of wood, and appears to be peculiar to zinc treated ties and does not prevail with creosoted ties.

As already indicated, zinc chloride treated ties have failed because (1) partially decayed or improperly seasoned before treatment; (2) improperly treated, either from excessive steaming, insufficient absorption of preservative, or unequal distribution of preservative throughout the tie; (3) poorly protected against mechanical wear; and (4) for lack of careful supervision of the entire process of treatment.

These factors have undoubtedly contributed much to the severe criticism of zinc chloride treatment. The committee feels that too much stress cannot be placed upon a proper recognition of these facts. A thorough study has convinced us that many of the records of short life are unquestionably to be ascribed to either one or more of the reasons given above.

Lack of proper mechanical protection stands out strongly as another reason for frequent failure of zinc chloride treated ties. While proper mechanical protection is essential on any treated ties, it is especially important on those treated with zinc chloride. Very slight mechanical abrasion or injury permits the preservative to leach out of the tie. Hundreds of thousands of zinc chloride treated ties have been removed from track in which the ends and middle were perfectly sound, but which failed immediately under the rail base.

Improper inspection and supervision of treatment is frequently responsible for the failure of zinc chloride treated ties. The solution is colorless and gives in iteslf no indication of its strength, nor is it easy to determine penetration by borings. Visual inspection of penetration is difficult, and more reliance must be placed on volumetric absorption. Slight errors in determining the strength of the solutions may have serious results. Zinc chloride treatment, furthermore, requires judgment of the condition of the wood before treatment, and a complete appreciation of the many variable factors making for good treatment require technical inspection and supervision at all stages.

General Recommendations

As a result of the study made, we submit the following recommendations with reference to zinc chloride treatment and the use of zinc chloride treated ties. The specification submitted takes the place of the one given in 1915 Manual, page 551, headed Zinc Chloride Treatment.

1. *Handling Ties Before Treatment.*—Ties should be promptly brought to the seasoning yard. All piles should be marked showing the age of the ties, and the fitness of ties for treatment should be based on the number of months seasoned rather than on visual inspection. Under all circumstances there should be absolute assurance that only sound ties are treated.

2. *Treatment.*—All ties should be treated according to the standard specification by the Burnettizing process, as follows:

Specifications for the Treatment of Ties by Burnettizing Process

Seasoning.—No ties shall be treated unless they are thoroughly air seasoned. The railway's representative shall at all times be the judge as to whether ties are seasoned sufficiently to obtain the required absorption of the preservative.

Classification of Timbers.—Only the same kind of wood, and, as far as possible, only the same sizes shall be treated in the same charge, unless permission is obtained from the railway's representative to treat certain specified kinds of wood or certain specified sizes in the same charge.

Absorption.—The amount of zinc chloride absorbed shall be on the basis of an average of ½ pound of dry zinc chloride per cubic foot of wood. In any one charge the minimum absorption allowed shall be 0.45 lb. per cu. ft. If the average absorption falls below this quantity, the charge will have to be retreated. The maximum absorption allowed in any one charge shall be 0.55 lb. per cu. ft. Deficiency in absorption in any one charge shall be made up in subsequent charges. Under no circumstances shall the actual solution used be stronger than 5 per cent. In all cases the solution shall be as weak as possible with the highest possible volumetric absorption.

For red oak ties the solution shall be approximately 4 per cent, or less, and at least 20 per cent by volume of the solution shall be injected. For pine and other coniferous woods, the strength of the solution shall be not more than 2 per cent, and at least 40 per cent by volume of the solution used shall be injected. For woods other than oak and pine the volumetric absorption shall be as high as possible. The exact figure to be used shall be determined by the railway's representative. After determining this figure, the solution to be used shall be as weak as possible, consistent with obtaining an absorption of ½ pound of dry zinc chloride per cu. ft. and the necessary volumetric absorption. The amount of solution absorbed shall be determined by calculations based on the gage readings of the working tanks. The gage or gages should frequently be tested as to their accuracy. This absorption should be checked occasionally by weighing an entire charge of ties before and after treatment on a suitable track scale. The weighing of one charge in ten shall be considered sufficient. The strength of the solution at all times and at all stages shall be carefully controlled by chemical titration, using a silver nitrate solution with potassium chromate indicator.

Treatment.—All ties after being placed in the cylinder shall be subject to a preliminary steam treatment for at least one hour and not more than two hours, at a pressure not exceeding 20 lb. After the steaming, a vacuum shall be drawn for one to two hours, and where it is necessary to break the vacuum in order to empty the cylinder of condensed water, a subsequent vacuum shall be drawn following the emptying of the cylinder. In all cases the most complete vacuum, consistent with the elevation of the treating plant, shall be obtained.

The zinc chloride solution shall then be introduced into the cylinder at a temperature not less than 130 deg. F. nor more than 180 deg. F., and a temperature of at least 150 deg. F. shall be maintained throughout the entire operation. A pressure of approximately 125 or more lb. per sq. in. shall be applied for a sufficient period to obtain the proper volumetric absortion.

Any ties, regardless of the amount of preservative in-

jected, shall be deemed completely treated when, at any time during the latter part of the pressure period, the pressure having been held at 165 or more lb. continuously for a half-hour period, the absorption during such a period is less than 5 per cent of the total volume of zinc chloride solution which is to be injected into the charge.

3. *Handling Subsequent to Treatment.*—Cross-ties treated with zinc chloride should be air seasoned, preferably at the treating plant after treatment, for at least 60 days before insertion in the track. We base this recommendation on the following factors:

1. Thorough air seasoning of treated ties will give increased strength to cross-breaking and increased spike-holding power. It will also result in reducing plate rail wear.

2. Air seasoned ties will show a saving in shipping weight.

3. By air seasoning ties either at the treating plant or at distributing yards a better distribution will be obtained than if they are scattered on the right-of-way.

4. Air seasoned ties will show a reduced tendency to leaching.

5. It is essential to air season zinc treated ties to prevent signal disturbance.

6. By air seasoning ties at storage yards, a shipping reserve will be established, to be drawn on when cars are available.

4. *Supervision and Inspection.*—All stages of the handling of ties both before and after treatment require careful supervision. It is strongly recommended that provision be made for the thorough supervision of all stages of the treating process by a competent technical man, preferably of chemical training, at the treating plant, under the direction of the railroad official in direct charge of wood preservation.

Where and When Zinc Treated Ties Can Be Used

The geographic region in which zinc chloride ties could be recommended was made the subject of study by the committee. Realizing that the present emergency conditions warrant the use of zinc chloride, in many regions where under nromal conditions it would not be used, a meeting was called at Madison, Wisconsin, on October 10th to determine the best possible procedure, with the result that the following resolutions were unanimously adopted:

1. "That the line of demarcation for the present emergency practice as between zinc chloride and creosote oil in the treatment of cross-ties, north and west of which zinc chloride should be used, follow the line of 45-in. rainfall, starting on the coast of Texas and going north to the point where the south side of the extended line of the state of Tennessee would intersect the 45-in. line, follow the south side of Tennessee to the ridge of the Alleghenies, thence following the ridges of the Alleghenies until it intersects the 40-in. rainfall line and thence along the 40-in. line to the Canadian border."

2. "That where due to emergency conditions the supply of creosote oil is not available for ties in region south and east of this line, zinc chloride be used."

The committee recommends that these resolutions be submitted to the association for approval while the present emergency conditions prevail. The basic line upon which the use of zinc chloride treated ties has been drawn was developed from information submitted to the committee by the United States Forest Service and from information collected by the committee covering actual track service.

General Conclusions

The committee, recognizing that the conclusions to be drawn from track records and track tests may lead to a too optimistic conclusion as to what could be expected on an average over the whole field, and perhaps obscure the possible result to be obtained from other preservatives, feels that misleading conclusions may be drawn, unless we present the general aspects of the whole situation after the study we have devoted to it, so we, therefore submit the following conclusions:

1. That creosote is the best timber preserving agent known for all purposes, and by reason that its composition is not affected by either rainfall or temperature, and in addition has a lubricating effect on the wood which diminishes the injury due to mechanical wear, and this combination of qualities places it at the head of all treating preservatives.

2. That where for economic reasons creosote oil is not available, or other conditions of maintenance will not justify the expense for creosote treatment, the adoption of zinc chloride is without question justified in the treatment for ties. Climatic conditions will go further in determining the economy of this treatment than in any other, and as one can unquestionably figure on doubling the life of the untreated timber by its use, and in dry climates this life will undoubtedly be extended.

3. That in localities where the rainfall is excessive and with a humid atmosphere, where good zinc chloride treatment would be unfavorably influenced by leaching, and in any climate where checking of the timber is likely to be excessive, or the mechanical abuse of the fiber is extreme, and it is not considered possible to secure a straight creosote treatment, the introduction of some lubricating agent with zinc chloride will have a beneficial effect in retarding the destruction of the timber from the above causes.

Appendix C—Indicators for Determining the Burnettizing of Ties and Timbers

The basis for the investigation was the work done by E. Bateman, chemist on forest products, and his report issued by the United States Department of Agriculture, Forest Service, Circular 190, entitled "A Visual Method for Determining the Penetration of Inorganic Salts in Treated Wood."

In his method a representative disk of the treated wood is cut as a test piece. The freshly cut surface is dipped for an instant in a 1 per cent potassium ferrocyanide solution. The entire surface should be moistened, but the disk should remain in the solution not more than 10 seconds. After the disk has been thus moistened, the excess of the solution is removed from the face by blotting paper. The moistened block is then dipped into a 1 per cent solution of uranium acetate and allowed to dry. At first the whole block may have a reddish tinge, but, on drying, the untreated portions will have a dark red or maroon color, while the treated portions will be slightly whiter than the natural wood."

While this method has been in use for several years, many operators have found that the method of applying the test was not satisfactory, and also that the line of demarcation between the treated and untreated areas was not clear and distinct. The committee has therefore developed another method (described in the report) which continues to use the same chemicals as given by Bateman. The committee feels that these changes in the application of Mr. Bateman's method constitute a very decided improvement and should be used by all operators in checking the penetration of the preservative in the Burnettizing process. The committee is working on a method for determining the penetration of zinc chloride in red oak and hopes to have this ready for next year.

Discussion

C. M. Taylor (Chairman): The particular work before the committee this year was the revision of the creosote oil standards up to the present time. The revised specifications for creosote oil are given in Appendix A. The basic changes in the old specifications as now appearing in the Manual are not very great. Section 5 of each specification for creosote oil covers a new refinement for determining the purity of oil which says that: "The specific gravity of the fraction between 235 deg. C. and 315 deg. C. shall not be less than" a certain gravity. That clause has been added in order to tie down the high boiling point fractions. Further there has been added the process given under Sec. 6 of each specification. This is another guarding point to take care of high boiling point fractions, likewise, Sec. 7 of each specification. These specifications are proposed for adoption and publication in the Manual. I move their adoption.

J. L. Campbell (E. P. & S. W.): As a matter of information, I would like to ask the committee if in the preparation of these specifications it had any consultation with the manufacturers of creosote to ascertain if there would be any material difficulty or objection to compliance with the provisions of the specifications? We not infrequently run up against strenuous objections of the manufacturers to furnishing material according to the specifications for various reasons which they set up.

Mr. Taylor: The manufacturers assure us there is no reason why the specifications given here cannot be followed.

The Chairman: I ask the committee if these specifications as revised are the same as adopted by the American Wood Preservers' Association?

Mr. Taylor: They are the same as proposed for adoption by the American Wood Preservers' Association, so the two associations are proposing to have exactly the same specifications, so that we will have two oil specifications alike under which people may work, and they will both be the same if they are both adopted.

C. E. Lindsay (U. S. R. A.): Can the committee give us any information as to what increased quantity of creosote oil per cubic foot should be injected when grades 2 or 3 are used.

Mr. Taylor: The committee is not prepared to propose any standard for that. When you use grades 2 and 3, you are not using the best grade of creosote oil; consequently, what one might consider a factor of safety might not appeal to another engineer.

(The motion was carried.)

(Mr. Taylor then presented for adoption and publication in the Manual the following: Specifications for creosote-coal-tar solution; precautions to be followed in the purchase and use of the creosote-coal-tar solution; that the heading in the Manual which covers the point, "Methods of accurately determining the absorption of creosote oil," be changed to read, "Methods of accurately determining the absorption of creosote oil and creosote-coal-tar solution"; extra instructions in the actual analysis of creosote oil; standard specifications for zinc chloride; a new method for determining the strength of zinc chloride solutions; the specification for the treatment of ties by the Burnettizing process.)

(The action on the above was favorable in each instance.)

Mr. Taylor: In connection with the report on zinc chloride treatment, the committee went into the discussion of it primarily from a war standpoint. The conclusion was that because of the scarcity of creosote oil there were certain territories where at that time it was not advisable to use anything but creosote oil if it was available, and that in the other parts of the country zinc chloride should be used. The line of demarcation between the territories that should use the zinc chloride and those which should use the creosote oil follows very closely the 40 in. rainfall. It starts in Texas and goes up to the Canadian border at a point very close to Maine. That line is one that possibly by future committees will be advanced further north and further west, and coincide with what has been the line previously between the roads that use zinc chloride and those that use creosote. In connection with this study they came to the conclusion that there were three general conclusions that should guide any railroad in determining what treatment should be used in their particular locality. These conclusions are merely submitted to you for your information.

The final part of our report is in connection with subject 5, "Report on indicators for determining the Burnettizing of ties and timbers." There is nothing new about this indicator for determining the penetration of zinc chloride in timbers, except we have taken what has been done by the Forest Service and improved it some.

(The committee was excused with thanks.)

Progress Report on Stresses in Track

DURING THE YEAR the data of the tests to find the effect of counterweight of locomotive drivers made late in 1917 on the track of the St. Louis-San Francisco have been worked upon with very interesting results. Tests were also made on the track of the Illinois Central to find the effect of counterbalance of the Mikado locomotive. Other tests were made on the Illinois Central and the Chicago, Milwaukee & St. Paul to determine the distribution of pressure immediately under the tie and also the stresses in the tie, and considerable work has been done in reducing the data.

The committee plans to study the results of the experimental data now available and to take up the preparation of a report upon the part of the subject so covered. It is believed, too, that sufficient information has now been accumulated to begin the discussion of the relation of the results to the principles governing the design of railroad track. It is expected also that the test work will be continued during the coming year.

Committee: A. N. Talbot (Univ. of Ill.), chairman; W. M. Dawley (Erie), vice-chairman; A. S. Baldwin (I. C.), G. H. Bremner (I. C. C.), John Brunner (Ill. Steel Co.), W. J. Burton (M. P.), Chas. S. Churchill (N. & W.), W. C. Cushing (Pa. Lines), Dr. P. H. Dudley (N. Y. C.), H. E. Hale, Robt. W. Hunt, J. B. Jenkins, George W. Kittredge (N. Y. C.), P. M. LaBach, C. G. E. Larsson (Am. Br. Co.), G. J. Gray (U. S. R. R. A), Albert Reichmann (Am. Br. Co.), H. R. Safford (U. S. R. R. A.), Earl Stimson (B. & O.), F. E. Turneaure (Univ. of Wis.), J. E. Willoughby (A. C. L.).

Discussion

A. N. Talbot (Chairman): The tests made on the Frisco last year show that stresses in the rails under the main drivers were on the average nearly four times as great at a speed of 50 mi. an hour, as at 5 mi. an hour with the Santa Fe type of locomotive. The stresses found in the rail under the Pacific type of locomotive ranges from 60 to 70 per cent more at a speed of 60 mi. an hour than the stresses at 5 mi. an hour. Tests made on the Illinois Central during the summer with the Mikado type showed that at 45 mi. an hour a speed materially higher than is permitted on the road, stresses were about twice as great as at a speed of 5 mi. an hour.

In all these cases the trailer and even the front trucks of the locomotive showed an increase in stress at times corresponding to the position of the counter weight on the drivers which gave the highest stress. Under the main driver the maximum effect was reached when the counter weights were down.

In addition to this work with the locomotives and the effect of counterweights, tests have been made on ties in the track to determine from the flexure of the ties the effect produced in them of the distribution of pressure upon the ballast lengthwise of the tie. While it is a very difficult matter to get these bending movements and the distribution very closely, we shall have some information on these points. I can only say that the ordinary wooden cross-tie seems to be subjected to all kinds of stresses by bending in different directions.

The committee was disappointed last year because there was no opportunity for the members to study the report and to discuss it.

C. E. Lindsay (U. S. R. A.): I would like to ask the committee if in their experiments they have used 8-in. by 8-in. ties, and whether they have considered the use of a 7-in. by 9-in. tie with the long axis vertical at the joint?

Prof. Talbot: The committee has used 6-in. by 8-in. ties and 7-in. by 9-in. ties with the wide dimension horizontally, but not the 8-in. by 8-in. It has not been proven so far I think that a greater vertical dimension would be of advantage. There is nothing to indicate that a decrease in the amount of bending would be of advantage to the track. It may be that it is desirable.

C. P. Howard (I. C. C.): I would like to ask Prof. Talbot if the increase in the static pressure developed by these experiments does not coincide closely with what was found to be the case in short spans of bridges.

Prof. Talbot: I presume that the results would be much alike, but the conditions are considerably different. In the case of the short spans another element enters, namely the deflection of the structure. If a bridge has a solid floor, it may be expected that the condition then, aside from the deflection on the structure, will be very much the same as in the track.

W. M. Camp: Prof. Talbot touched on two or three matters that seemed to me to be a very practical application of those stresses in the track. One was the fact that where the end of a tie is not well supported by a bank outside, the flexure is greater than it is where there is a good bank to support the end of the tie and the ballast. I should think another very practical study would be economical length of ties. Another question which comes up is in regard to the weight of rail in relation to the length of tie.

Prof. Talbot: The committee has had in mind the study of the effect of the length of ties upon action in the track. These tests should be made some time after the tamping is done to see what the conditions become then, because it is quite evident that the conditions to which the tie is subjected immediately after the tamping may be far different from those which come upon the tie after a considerable time has elapsed.

(The committee was relieved with the thanks of the association.)

Report of Committee on Roadway

THE COMMITTEE SUBMITTED as information eight profiles of specific instances of shrinkage of embankments on the Atchison, Topeka & Santa Fe, giving the percentage of material required to restore the several embankments to their original width after a lapse of four years' time.

The prevention or cure of water pockets is a subject which has been before the committee for several years. In 1914 a circular letter was sent to the different members of the association, asking certain questions in regard thereto. A large number of replies were received to this inquiry and the sub-committee of that year made a progress report. The committee at that time was not ready to form conclusions either as to the best method of preventing water pockets or the best method of curing water pockets that exist. We do not find that anything of particular interest along these lines has been developed since that report, except that of specially preparing the roadbed before laying track by means of rolling.

It is desired, however, to report on this subject, and we have condensed and tabulated the replies made to the circular letter above referred to, and attach a copy of the replies. From these replies and our own experience along this line, we would recommend the following conclusions be adopted for inclusion in the Manual:

CONCLUSIONS

(1) Water pockets have existed for many years in certain localities since construction.

(2) They have increased and become more noticeable since the use of heavier equipment and greater density of traffic.

(3) In water pockets the ballast has generally been beaten down into the roadbed and formed troughs under the track, the sub-ballast and roadbed being pushed out laterally and sometimes raised, forming walls, to prevent the water draining from under the track.

(4) Water pockets exist in fills as well as cuts, but more generally in cuts of a clayey nature.

(5) They exist in localities where soil conditions are unfavorable to satisfactory maintenance, particularly in clay.

(6) Method of surfacing and tamping track has no particular effect in forming water pockets, but the class of material used as ballast does have considerable effect.

(7) Water pockets can be prevented in many cases by proper formation of roadbed and use of proper kind and depth of ballast, as follows:

(A) Where the roadbed, in either cuts or fills, is composed of a more or less clayey material, after the work has been brought to a sub-grade all construction tracks should be removed and the sub-grade rolled with a road roller weighing about ten tons, to a uniformly smooth surface with either sufficient crown or side slope to shed water; any resulting depressions below sub-grade being loosened up with a plow and brought up to sub-grade by the addition of material of the same kind as that composing the roadbed; and then rerolled. After several years' use under traffic it may be necessary to cut through the shoulder of the sub-grade at frequent intervals to afford drainage, as the sub-grade under the track will settle several inches lower than the shoulders.

(B) Sub-ballast should be of engine cinder, screenings or other similar material, so as to prevent the roadbed working up into the ballast proper. Stone ballast

should not be used directly on top of clay or loam roadbed.

(C) Sufficient depth of ballast should be provided to insure even distribution of the load on the roadbed.

(D) Construction trains should not be run, if possible to avoid, over track laid on new roadbed without ballast. This drives the ties into the roadbed and forms depressions, which later on develop into water pockets.

(E) In wet cuts, sub-soil drains of vitrified bell and sewer pipe should be laid on a 4-in. well-tamped bed of engine cinders in deep ditches, with uncemented joints, and the trench then back-filled with same material as removed if at all porous, otherwise back-fill with engine cinder.

(F) Wet cuts of clay should have sufficient crown to drain properly, and the surface should be smooth. Any back-filling necessary to make a smooth surface should be made of the same material as exists in the cut.

(G) In building new roadbed alongside existing tracks on same grades, care should be taken not to form new roadbed of impervious material at a higher elevation than the original roadbed, but the new roadbed should be kept at or below this level so as to provide an outlet for the drainage through the existing ballast. This is particularly important on hillside construction. If change in existing gradient is to be made, new roadbed for both tracks should be on same level.

(8) In curing water pockets the principal object is to provide proper drainage. This may be accomplished, according to localities, in several ways, as follows:

(a) In cuts, by means of sub-soil drains of vitrified bell and sewer pipe, laid in ditch or between tracks with uncemented joints. They should be laid at such depth as to be below any movement of the sub-grade and below the water to be drained. They should be below the frost line. Lateral drains of pipes or of cinder or stone may be made to tap the pockets if necessary. Pipe should be covered 12 in. or more with porous material, and then the trench should be back-filled with the same material as removed, if at all porous, otherwise use engine cinders for back-filling.

(b) In cuts where material is very soft to a considerable depth, a drain about 3 ft. square may be provided of large stone, either in the ditch line or between tracks, and of sufficient depth to take the drainage.

(c) In cuts where material is soft to a great depth, old ties or bridge timbers may be driven just outside the ends of the ties. These serve to hold the roadbed in place and to some extent lower the water level, leaving the top surface of the roadbed more firm.

(d) On fills, water pockets should be tapped by lateral ditches and filled with porous material so as to drain.

(e) In many cases the material will have to be excavated and a bed of old timber, cinder or other material spread over the surface to provide sufficient area to prevent the further penetration of the ballast into the roadbed, and the ballast should then be replaced with good, clean material.

Committee: W. M. Dawley (Erie), chairman; J. A. Spielmann (B. & O.), vice-chairman; J. R. W. Ambrose (Tor. Term.), H. E. Astley (N. Y. N. H. & H.), C. W. Brown (L. & N. E.), S. P. Brown, B. M. Cheney (C. B. & Q.), C. W. Cochran, W. C. Curd, Paul Didier (B. & O.), S. B. Fisher (M. K. & T.), W. C. Kegler (C. C. C. & St. L.), H. W. McLeod (C. P. R.), C. M. McVay (K. & M.), F. M. Patterson (I. C. C.), W. H. Petersen (C. R. I. & P.), P. Petri (B. & O.), W. F. Purdy (Mon. Sou.), R. A. Rutledge (A. T. & S. F.), W. H. Sellew (M. C.), J. M. Sills (St. L.-S. F.), W. P. Wiltsee (N. & W.),

Discussion

W. P. Wiltsee (representing the committee): Five subjects were assigned to the committee and we have reported on two. It is the intention of the committee that the profiles presented be received as information. I so move.

C. P. Howard (I. C. C.): I would like to call attention to these profiles, that nothing is said about subsidence, and, therefore, we will assume that all the diminution in the size is shrinking and not subsidence. I wonder if the committee has found any of the settling was due to subsidence, and also if it made any effort to find out how the embankment was formed down toward the bottom. I ask if the committee knows how much material and excavation it took to make the banks, and whether the banks as finally shrunk were greater or less than the amount of material in the excavation.

Mr. Wiltsee: I do not think those points were considered, but the committee will consider them this year.

R. H. Ford (C. R. I. & P.): Before we receive these profiles, I would say that the amount of subsidence shown is very small. I think they are open to some question as to their thoroughness of preparation.

Mr. Wiltsee: This profile shows shrinking and not subsidence. The matter of subsidence does not enter into that.

Mr. Ford: I will substitute shrinkage for subsidence; it applies in either case. The shrinkage of these banks is much less than the experience of the average man.

W. H. Hoyt (D. M. & N.): These fills have been brought up to their original level by adding more material. Now, apparently that provides not only for shrinking, but also for any subsidence that may have occurred in these fills. As this question is an important one, and as these profiles do not show the class of material and many other points that might have an important bearing on the accuracy of the statements in the report, I do not think we will be justified in publishing them.

George H. Bremner (I. C. C.): I think it is important to indicate the part of the country to which these profiles apply, so that we would better understand the conditions surrounding them.

(After further discussion, the motion that the profile be received as information and published in the proceedings was carried. Mr. Wiltsee then read the matter on the curing of water pockets, including the conclusions, and moved its adoption and printing in the Manual of the association.)

J. G. Sullivan: I think that practically everything the committee has said there is thoroughly good practice. I would like to see it amplify one feature if possible, and that is the crowning of the roadbed. My experience has been that after we started crowning roadbeds we were getting a great deal better results in countries where material will hold water. There is some objection to it in a country where you lay track in the frost, but that is offset by the benefit you derive from the condition of the track afterwards.

One other feature that I should think might be added, although it is hard to control, and that is the time at which you lay track. If you lay track in the spring with the frost in the ground or just going, it causes more trouble in forming a pocket after the track is laid than any other one thing.

Mr. Ford: I think we all realize the force of what Mr. Sullivan has said about this. There is one thing which he has not alluded to, which I do not see covered in here. As an investment, it is very often desirable if the road can be graded a year previous and left to weather. The interest on the money that is expended for grading and letting it lie a year is a good investment. Some of the paragraphs which have been alluded to here might not be necessary, but I notice that they are not

made obligatory, but that they constitute a method whereby work can be done.

The Chairman: Par. F has been changed to read "All roadbed should have sufficient crown to drain properly, and the surface should be smooth." Does that cover it?

Mr. Sullivan: And it should be maintained in this condition until ballast is placed on it.

The Chairman: It now reads: "All roadbeds should have sufficient crown to drain properly, and the surface should be smooth, and maintained in this condition until the ballast is placed." The last word in the paragraph "cut" is changed to "roadbed."

C. W. Baldridge (A. T. & S. F.): It seems to me that Art. E, under (7), should be made to agree with Art. A, under (8). The object is exactly the same. Art. E does not provide for covering the pipe with positively porous material, and I would suggest that both articles be made to read: "All pipe should be covered 12 in. or more with engine cinders or equally porous material," and then the trench be back filled with the same material as removed, if at all porous, etc."

Mr. Wiltsee: The committee will accept that amendment.

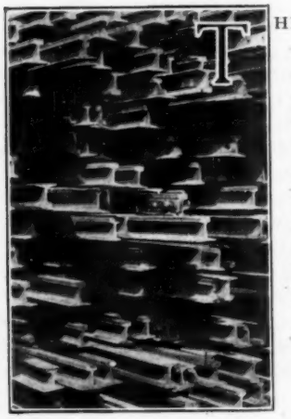
(Following this there was an extended discussion as to the practicability of applying these conclusions in actual work, it being the contention that they were too theoretical.)

A. S. Baldwin (I. C.): It is a very discouraging thing to a committee to submit a report of this kind, and not secure publication. I am quite sure that a number of years ago when I was doing such work, such information as is given in this report would have been very valuable. We cannot expect to have a perfect report under any conditions, and, therefore, I would like to see this report included just as it is written and printed in the Manual.

(After some further discussion Mr. Wiltsee's motion was put and carried.)

The committee was then dismissed with thanks.

Report of Committee on Rail



THE SPECIFICATIONS for steel rails in the Manual are in need of revision in the light of knowledge gathered in recent years, and specifications were submitted in Appendix A for consideration and discussion during the coming year. A number of changes have been made from the present specifications in the Manual, all of which should be given careful thought, but mention may be made of the following:

a. The manganese is raised 10 per cent in both lower and upper limits in open-hearth rails, making the proposed requirement 0.70 to 1.00 per cent.

b. For open-hearth rails of 111 lb. per yd. and over the carbon is made 0.67 to 0.80 per cent, an increase of 0.05 per cent for the heaviest class of rails.

c. For open-hearth rails the acceptance analysis is made on a sample from the finished rail instead of the ladle test ingot.

d. The bending of the rail in the physical testing may be accomplished by either the drop test or the quick bend test (hydraulic bender), as agreed upon in the contract.

e. The elongation is required to be at least 8 per cent in 1 in. instead of 6 per cent.

f. Three test pieces for bending are selected from each heat of open-hearth rails and all three are required to meet the requirements.

In order to decrease the pressure required to gag a rail, Dr. P. H. Dudley has been making experiments at several mills with the supports in the gag press increased from the usual spacing of 42 in. to spans up to 60 in. Curves of the relation between the distance between supports and the load required to produce permanent set show that the load decreases as the span increases, and consequently the local pressure of the bending die and the distortion of the metal at the point of pressure would decrease. Some experimental work has been done in gagging rails with the longer spans and we hope to have some developments to report at a later date.

A standard method of testing rail joints is desirable to enable the results of different laboratories to be compared with each other, which cannot now ordinarily be done, due to differences in the details of conducting the tests. The Committee submits in Appendix B a method of testing rail joints with the recommendation that it be adopted and included in the Manual. This method proposes a span of 4 ft. between supports, which is longer than has been used in most investigations of rail joints, but is done for the purpose of allowing the test to be made with a lighter load and thus allowing it to be made in a greater number of laboratories. This is also the span used in the hydraulic bend test of rails and in the drop test of sections of rail 111 lb. per yd. and over.

The Pennsylvania Railroad has continued work with the hydraulic or quick bend method of testing rails. This method seems to be preferable to the drop test, in that it gives more complete information, is quicker of operation and the breaks also are practically always normal tension breaks of the part in tension, which is frequently not the case in the drop test. For these reasons it has been included as an alternative method of testing rails in the proposed specifications for steel rails submitted with this report.

Another method that is being tried for the examination of the interior condition of rails is the process of deep etching of longitudinal sections, in strong acid. The Altoona Laboratory has examined some longitudinal slabs about ¼ in. thick, cut from the interior of the head of transverse fissure rails, by keeping them for two hours in a hot mixture of hydrochloric and sulphuric acids. The committee has modified this method by taking a ¾-in. slab consisting of the top part of the head. This slab is etched or pickled for 30 to 45 min. in strong commercial hydrochloric or muriatic acid in a large porcelain dish and kept at a temperature of about 180 deg. F. The committee expects to have some results from these examinations to report at a later date.

Recommendations

The committee submits the following recommendations:

1. That the method of testing rail joints submitted with this report be adopted by the Association and included in the Manual.

2. That the revised specifications for steel rails submitted with this report be printed in the Proceedings for consideration and discussion during the coming year.

Committee: G. J. Ray (D., L. & W.), chairman; H. B. MacFarland (A., T. & S. F.), vice-chairman; E. E. Adams (U. S. R. R. A.), J. A. Atwood (P. & L. E.), A. S. Baldwin (I. C.), W. C. Barnes (S. P.), Chas. S. Churchill (N. & W.), W. C. Cushing (Penn. Lines), G. M. Davidson (C. & N. W.), Dr. P. H. Dudley (N. Y. C.), J. M. R. Fairbairn (C. P. R.), L. C. Fritch (C., R. I. & P.), A. W. Gibbs (P. R. R.), J. D. Isaacs (S. P.), Howard G. Kelley (G. T.), R. Montfort (L. & N.), A. W. Newton (C., B. & Q.), J. R. Onderdonk (B. & O.), H. R. Safford (U. S. R. R. A.), J. P. Snow (Cons. Engr.), F. S. Stevens (P. & R.), E. Stimson (B. & O.), R. Trimble (Penn. Lines), F. M. Waring (P. R. R.), M. H. Wickhorst.

Appendix B. Standard Test for Rail Joints

In order that comparison of results of different types of joint bars may be made, the uniform method of procedure for laboratory test shall be as follows:

General Assembly. Complete rail joints, full bolted, shall be used. Before joints are bolted the loose scale shall be removed from the contact surfaces of rails and joint bars so that there may be clean, dry surfaces for surface contact. Rail joints shall be then subjected to tests that will show the strength and deflection of the joint under transverse load with head up and also with head down. The results are to be compared with a test of a continuous rail of the same span for determination of rail joint efficiency and rigidity. The joints are to be bolted with heat-treated bolts, or if other bolts are used the quality and kind of bolt shall be stated. The rail used for test of joints shall be cut from the same piece of rail as rail for continuous span. Rails used for test pieces shall be preferably from the same rail, or at least from the same heat of rails. New rails and joint bars shall be used for test.

Quality of Material. Material for both rail and joint bars shall be subjected to standard tension tests, to hardness tests, to chemical analyses and, if heat-treated material, to microscopic examination. Measurements to be recorded for joint bars of the area sketch of section, moment of inertia, length, weight, location of bolt holes, camber if any. Measurements of rail section include area sketch of section, moment of inertia, weight per yard, location and size of bolt holes. Joints are to be bolted up so that there shall be a space of ⅜ in. between the ends of the adjoining rails. Bolts are to be applied so that they shall not be in contact with the sides of the bolt holes through the rails. If necessary ends of rails to be faced off to give required spacing and bolt clearance.

The supports shall be solid, flat bearing surfaces with vertical faces 48 in. apart, with the inner edges rounded off to ⅛ in. radius. The load to be applied midway between the supports by a block, having a radius of 16½ in., and a width not less than the width of the base of the rail.

Loading. An initial load of 3,000 lb. shall be made at which load the deflectometer shall be set at zero. Uniform increments of load of such magnitude shall then be applied to accurately define the elastic limit. Maximum deflection and set to be determined for each increment of loading. Deflections and permanent sets to be measured to one-thousandths of an inch. Loading to continue until adjacent rail ends meet. Note is to be made of readings of the load at which the joint bars or rails commence to scale.

Number of Tests. Three concordant tests shall be made, and results shall be recorded in detail. Abnormal tests to be discarded.

Efficiency. The efficiency of a rail joint is expressed as the ratio of the elastic limit in pounds of the rail joint divided by the elastic limit of the continuous rail; this efficiency to be given first with head up, second with head down, using data to correspond to conditions imposed. Rail joint efficiencies shall be expressed in per cent.

Rigidity. The rigidity of a joint is a comparison of the deflections of the rail and the joint under the load that develops the elastic limit of the joint. It is the ratio expressed in per cent, of the deflection of the rail to the deflection of the joint at this loading; that is, the deflection of the rail divided by the deflection of the joint at the elastic limit of the joint.

The rigidity shall be expressed for the two conditions of test, with head up and with head down.

Appendix I. Transverse Fissures

By Dr. P. H. Dudley

Government investigators class interior transverse fissures as fatigue fractures of metal while railroad officers have facts from their service records of rails which prove that they are not fatigue fractures of metal. The government investigators do not explain the origin, time and place of occurrence of the nuclei, nor the variation in size from $\frac{1}{16}$ to $\frac{3}{8}$ in. in diameter of the type of interior transverse fissures classified by me as intergranular. All fractures of this type show nuclei of considerable area, and that they are not points. These areas constituting the nuclei, rupture as a unit and not in detail, showing positively and conclusively that fracture was caused by the application of a rapidly applied blow of a pressure beyond the elastic limit, or even ultimate strength of this interior core of inferior metal.

The government investigators conclude that the fracture of the nucleus and the subsequent development constitutes a fatigue fracture of metal, but as they occur only in an occasional rail head of like design, under the same traffic conditions, railroad officers do not accept this statement. There is, however, no difference of opinion between the railroad officials and the government investigators about the growth in the track of the specular surfaces which start from and around the nuclei of interior transverse fissures.

I have mentioned in previous communications to the Rail committee that rails rolled from reheated blooms did not develop as many interior transverse fissures in the track as rails rolled direct from the ingots. I have collected the service records of eight railroads. These reported 559,644 tons by direct rolling for the years 1909 to 1915—given in detail per year—and 1054 interior transverse fissures were developed. The railroads also reported 322,593 tons from reheated blooms which developed only 59 interior transverse fissures. The rails were rolled at 11 different mills.

The railroads are to be congratulated that the Rail committee statistics of the service records of rails show at the present time a remedial method of manufacture of rails which at least reduce the interior transverse fissures 90 per cent in the output.

Appendix J. Frictionless Rail

The committee made an investigation of the extent to which frictionless rail is in use on steam roads and the results following its installation. The committee ascertained that 27 steam and 7 electric roads had installations of this form of rail and presented abstracts of reports made to it regarding the service which this rail was rendering.

Discussion

G. J. Ray (chairman) submitted Subject No. 1 and (1) "Revision of Manual" and said: It is the recommendation of the committee that the revised specifications for steel rails, submitted with this report, be printed in the proceedings for consideration and discussion, during the coming year. I want to ask the chairman to grant rail manufacturers the privilege of the floor if they desire to discuss this matter at the present time. I move you that these revised specifications be accepted and published as information and for discussion.

The Chairman: If there are any members of the rail manufacturers present who wish to discuss this question, we will be glad to hear from them.

M. A. Weymouth: As secretary of the Manufacturers' Rail Committee, I have been asked to present this: "To the American Railway Engineering Association: The manufacturers have had no opportunity to properly consider the requirements given in this specification. They, understand, however, from Recommendation No. 2, of the Report of the Rail Committee, that these specifications, as presented, are to be considered as a study

only and not as practical specifications to be used for commercial purposes. It seems that in order to bring the rail specification into a practical form which can be used by the railroads in contracting for their rail requirements, it will be highly desirable for the Rail committee to have a consultation with the rail manufacturers."

Mr. Ray: It is the intention of the Rail committee to ask the manufacturers to a meeting, probably, in the near future.

The Chairman: The motion is that the revised specifications for steel rails submitted with this report be printed in the proceedings for consideration and discussion during the coming year.

(Motion carried.)

Mr. Ray: Subject 5, assigned to the committee, is as follows: "Make critical study of joint bars from the standpoint of design and material, together with laboratory tests, including strain-gage measurements after having established a uniform method of comparative testing." The committee asks that the association adopt the method of testing rail joints submitted with this report, and included in the Manual. In order to get this matter before the house, I move you that the proposed matter be adopted by the association and printed in the Manual.

C. E. Lindsay (U. S. R. A.): I do not know what is meant by "Transverse Load" in "general assembly." And I also feel that the length of rail should be specified. You would get different results if you use a full 33-ft. rail.

H. B. MacFarland (Santa Fe): The transverse load refers to the load or application in a vertical direction. You possibly had in mind that it should be in a horizontal direction?

C. W. Baldridge (Santa Fe): I found in examination of failed joints that there is an idea among track men at least, that a good many joint failures or bar failures in the head of the bar are started by the wire edge on the under side at the head of the rail in the end. In the matter of testing it might be advisable in the assembly to provide for the underside of the head of the rail at the end, to be rounded off slightly, before the joint is assembled for the test.

Mr. MacFarland: It is not practicable, on account of there not being testing machines of various types throughout the country to take care of such a test. That would have to be a special test.

Mr. Baldridge: One reason I suggested the rounding off of the lower edge is that I think it would pay to have a man with a file to take off the feather edge on the lower side of the head of the rail at the end.

Mr. Ray: As a matter of information, I believe the trouble Mr. Baldridge speaks of can be overcome in an easier way by making some provision in the angle bar. There has already been done, and tests are under way at the present time, which indicate that there may be something in that.

The Chairman: The motion before the convention is that the method of testing rail joints submitted with this report, be adopted by the association and included in the Manual.

(The motion was carried.)

Mr. Ray: In connection with subject No. 7 I want to call the attention of the association to the data headed "special investigations."

(Mr. Ray then read from this section of the report.)

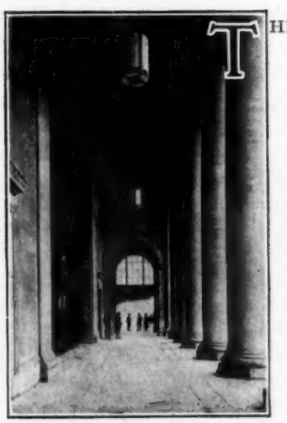
Mr. Ray: It is well for the association to bear this matter in mind, and any information that can be given that will either substantiate that argument or will change the results the other way, will be much appreciated.

Mr. Ray: At the time the report was gotten out, the report of the sub-committee on Intensity of Pressure due to wheel loads and resistance of rail steel to crushing and deformation had not been received. Since that time it has been received, but the chairman of the subcommittee is not here and he requested Mr. Bronson to say a few words, and I will let him tell you what has been done.

(C. B. Bronson (N. Y. C.) then described the tests made during the past year.)

The Chairman: In excusing this committee, with the thanks of the association, I will ask the members to send to the committee any data they may have on this subject.

Report of Committee on Buildings



THE COMMITTEE RECOMMENDS in its report:

1. That the matter under "Revision of Manual" be approved.

2. That the conclusions under the heading "Design and merits of high and low platforms at passenger stations" be approved and published in the Manual.

3. That the conclusions under the heading "Umbrella versus Butterfly sheds" be approved and published in the Manual.

The committee recommends that the same subjects be reassigned for the coming year.

Committee: M. A. Long (B. & O), chairman; G. H. Gilbert (Southern), vice-chairman; G. W. Andrews (B. & O.), D. R. Collin, W. H. Cookman (P. R. R.), C. G. Delo (C. G. W.), W. T. Dorrance (N. Y. N. H. & H.), K. B. Duncan (G. C. & S. F.), C. H. Fake (M. R. & B. T.), A. T. Hawk (C. R. I. & P.), F. F. Harrington (Virginia), E. A. Harrison (A. T. & S. F.), A. Larsen, J. W. Orrock (C. P. R.), S. B. Phillips (U. P.), R. V. Reamer (C. R. R. of N. J.), C. W. Richey (P. R. R.), John Schofield (C. N.), Z. H. Sikes (N. Y. C.), W. J. Watson (Cons. Engr.).

Appendix A—Revision of Manual

Definition of Terms Published in the Manual and Supplements Thereto

Station.—An established location for the accommodation of passenger and freight traffic. (Manual 1915, page 187.)

Transfer Platform (Freight).—A platform approximately level with freight car floors used in transferring freight from car to car. (Manual 1915, page 207.)

Shop Buildings.—Various structures for the construction and repair of locomotives, cars and other railway equipment. (Manual 1915, page 188.)

Engine House.—A structure for housing and the general maintenance of engines in service. (Manual 1915, page 188.)

Turntable.—A revolving structure for turning locomotives or cars. (Manual 1915, page 188.)

Transfer Table.—A traveling structure with a track on which a locomotive or car can be run and transferred

from one parallel track to another. (Manual 1915, page page 188.)

Coaling Station.—An established location for the storing and delivering of coal to locomotives. (Manual 1915, page 192.)

Oil House.—A building for the storage and distribution of oil and waste. (Manual 1915, page 194.)

Section Tool House.—A building for housing of section cars, tools and small track material. (Manual 1915, page 195.)

Power House.—A building for housing apparatus for supplying light, heat and power for various purposes. (Manual 1915, page 189.)

Rest House.—A building for the accommodation of employees, usually containing rest and recreation rooms, sleeping quarters, lunch room, lockers, bath, etc. (Manual 1915, page 208.)

Butterfly Shed.—A type of structure erected over platforms for protection from the weather with a central line of supports and roof sloped towards center for drainage. (Manual 1915, page 208.)

Umbrella Shed.—A type of structure erected over platforms for protection from the weather with a central line of supports and roof sloped to the sides for drainage.

Ash Pits.—A structure into which cinders are deposited from locomotives, for subsequent removal. (Supplement to Manual 1917, page 35.)

Inbound Freight House.—A building for the handling of freight for delivery to consignee. (Manual 1915, page 201.)

Outbound Freight House.—A building for the receiving of freight by the railroad for shipment. (Manual 1915, page 201.)

Following Additions to the Manual

Coaling Stations.—Where coal is stored in summer for use in locomotive stations in winter and where the amount stored is less than 75,000 tons, no special mechanical device is recommended, it being more economical to store it by unloading cars by hand or crane and reclaiming it by the use of tools that can be put to other use when not handling coal, such as locomotive crane, ditcher or steam shovel.

Ash Pits.—We wish to add an additional cut and description as follows:

A scheme for conveying and disposing of cinders through pipe by vacuum created by steam. In order to handle them by this method cinders must not be wet down.

Scales.—At terminal stations where scales can be given proper attention and where the volume of business will justify, dial scales are preferred for weighing mail, baggage and express.

Appendix B—High and Low Platforms at Passenger Stations

While very few railroads in this country have adopted platforms level with the car floors, they have always been the standard in use in Great Britain. One of the chief recommendations for raised platforms is the saving of time required for passengers boarding and leaving cars over that required for walking up and down steps at low platforms.

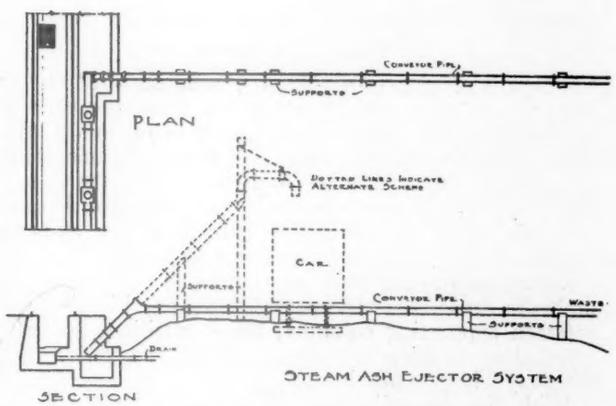
As the interchange of equipment is extensive, clearance must be provided for the widest equipment on the road involved. As passenger equipment is narrower than freight equipment, this arrangement leaves a void or space between the car and platform that might cause accidents to passengers who carelessly enter and leave trains. Some railroads are equipping their passenger cars with an extension flap to the trap door to bridge this opening; the operation of which is practically automatic. When the trap door is down the opening of the vestibule door causes the sliding portion to extend beyond the side of the car. Closing the door returns it to its normal position. When it is necessary to raise the trap at stations not equipped with high platforms it is not desirable for the trap to be extended. To provide for this feature a handle is set flush in the end of the car body by means of which a connection between the door and the trap may be disengaged. It is designed with a uniform extension to take care of a gap at platforms built on curves as sharp as 6 deg.

There are platforms in use in subways that have mechanical extensions moving out until they are practically touching the side of the car, so that there is practically no space between the side of the car and the platform.

Platforms are built either of wood, concrete or steel, or a combination of these materials. At important points, where traffic is heavy, they should be roofed over.

Where high platforms are used it is necessary to use a special design of baggage truck. One road having in use a great many high platforms is considering the construction of trucks on small wheels on which the baggage will be stored until the arrival of the train, the truck will then be pushed into the baggage car and left there with its load to be assorted while the train is traveling from one station to another. The baggage to be taken off at the next station will be loaded on this or a similar truck, so that an entire load can be taken out of the car as soon as the train stops. In this scheme the time consumed for handling baggage, express and mail at stations will be reduced considerably.

Low platforms are more universally used and consist of cinder fill, with or without wood or concrete curbs,



Plan and Section of an Ash Disposal System

brick with concrete curb, concrete with concrete curb, and concrete with a wearing surface of asphalt mastic.

In comparing high platforms with low platforms, the advantages in favor of the high platforms are as follows:

1st—Facility, rapidity and safety with which trains may be loaded or unloaded.

2nd—The prevention of the public crossing the tracks.

3rd—Where platforms are below the street level, a saving of about 3 feet in the vertical height to be traveled by passengers.

4th—Passenger, baggage, express and mail can be handled more rapidly, which means a reduction in the time of station stops.

5th—They afford convenient space for the housing of ducts, cables, signal equipment and sometimes elevator machinery.

6th—Where passenger traffic is heavy raised platforms permit the use of additional doors.

They have certain disadvantages:

1st—The cost of changing passenger equipment to serve both high and low platforms, and the cost of constructing subways or bridges for passengers express and baggage.

2nd—Where freight trains must use the tracks adjacent to high platforms the restricted clearances may prevent the operation of certain cars and cause heavy expense for transfer of freight.

3rd—The necessity for special form of baggage truck having a low floor.

4th—It is impractical to place a switch within the limits of the platform, due to lack of clearance for equipment.

By canvass of various roads it is found that low platforms vary from 5 ft. to 5 ft. 6 in. from the center of track to the face of platform curb, and level with the top of rail to 6 in. above it.

It is recommended that low platforms be built to 5 ft. 6 in. from center of track to face of curb and to be 4 in. above top of rail at curb.

Recommendations for the Manual

On account of the existence of high platforms at important terminal stations and the desirability of interchange of passenger equipment throughout the country, the committee suggests that the Association recommend to the M. C. B. Association that all passenger equipment in the future be so constructed that they can be used at either high or low platforms.

It is recommended that high platforms be provided only in connection with tracks devoted exclusively to passenger business.

Appendix C—Umbrella Versus Butterfly Sheds at Through Stations

There is no choice between the umbrella shed and the butterfly shed, so far as protection from the elements is concerned, the edge of the gutter being in the same relative position on both types. Neither one successfully accomplishes what they are designed for, as the edge of the roof must be kept outside of the clearance diagram, and this places the protective feature so far from the coaches that the benefit to passengers is limited.

Where no waiting room is provided in connection with umbrella sheds, it is recommended that partitions be built between supporting columns; these partitions to be located at every third bay where traffic is heavy, and every fifth bay where traffic is light.

With the umbrella shed type, two gutters and two leaders from the gutters to the central post are necessary. With the butterfly type no gutters are required. This eliminates the first cost for gutters and means lower maintenance cost.

Some railroads use circular supporting columns for the butterfly type, making use of this column for the regular down-spout. On account of the prevalence of cinders the drains at the bottom of the columns are likely to be stopped up and in cold weather the columns will freeze and burst.

In either type of shed it is recommended that at or below the platform level of the down-spouts a trap with clean-out be installed. It is considered preferable to place the down-spouts outside the supporting column.

At umbrella sheds in some parts of the country snow collects in such quantity that it becomes necessary to shovel it off. Consideration should be given roofing sheds in such localities, with a roof having a hard surface, as a composition roof is easily ruined by laborers digging into it with picks and shovels removing snow and ice.

A canvass of the representative roads shows that the cost of umbrella and butterfly sheds is very similar, an average pre-war cost being $1.10 per sq. ft., exclusive of the paving and curb.

The average height from curb to eaves is 16 ft. The average spacing center to center of supports is 30 ft.

The above average price covers the cost of various types of sheds, including the following:

(1) Steel supporting structure covered with wood sheathing and composition roofing.

(2) Frame supporting structure covered with wood sheathing and composition roofing.

(3) Pre-cast concrete columns and roof slab covered with composition roofing.

Conclusions

In that part of the country where heavy snow occurs the umbrella type of shed is preferable, though somewhat more expensive in first cost. In that part of the country where heavy snows are not a factor, the butterfly type of shed is preferable.

Discussion

M. A. Long (Chairman): The work covers a review of the Manual. The first work was to give a definition of terms published in the Manual and supplements thereto. I move that these be accepted and published in the Manual.

(The motion was carried.)

Mr. Long: The committee has decided to add an additional item with reference to coaling stations. A great deal of consideration has been given to the storage of coal, and a number of roads have gone to much expense for mechanical equipments. The committee considered at what point it would be economical for the railroad to go to this expense. I move that this matter be published in the Manual.

R. S. Parsons (Erie): I think the recommendation should be modified somewhat and made to read, "Unless said coaling storage site shall be in connection with the handling of coal from cars to hopper." In many instances if you use the same hopper for unloading the coal and practically the same machinery, you can with very little expense store the coal, providing you have the space. The only additional expense is that of reclaiming machinery which in some cases is simple and inexpensive. We have some such plants on our line where, while the entire coaling station is an expensive one the additional expense of permitting us to store some 30,000 tons of coal is very slight, the advantage of being able to free cars and store what coal you do not put immediately into your coaling pockets and then reclaiming it from the storage pile is very great in the releasing of cars; in keeping at the coaling station an adequate supply of coal to save the transportation department the difficulty of keeping a large amount of coal in the yards, and the advantage of having the coal there for use whenever you want it.

Mr. Long: The committee considered that point, but we did not have any figures showing what the operating costs for coal would be. We were told the cost would be about 25 cents a ton, which made it look high, and we thought that we could reach the same end by recommending the use of a ditcher or locomotive crane. You can store a maximum of 20,000 tons, which could be reached by a locomotive crane boom and taken from the storage pile and put into the hopper of the coaling station. The question is one of cost per ton handled.

Mr. Parsons: I personally feel that reclaiming will not cost over five or six cents a ton from the storage pile.

R. H. Ford (C. R. I. & P.): The best device is the modern coaling plant with an auxiliary, a large storage pile so arranged that locomotive cranes can do the loading and the propelling as well. So far as the cost of 25 cents a ton is concerned, I don't know where the gentleman got his figures, but that is enormous. Ten cents ought to cover the operation if the coal is within a reasonable distance, that is, less than half a mile from the coaling plant.

Mr. Long: That cost is brought about by the investment in a special plant for distributing coal to the storage pile and reclaiming it. That may be exaggerated. (Mr. Long's motion was put to a vote and carried.)

Mr. Long: We would like to add to the Manual a paragraph with reference to scales. A question came up in regard to the report that is now in the Manual, stating that it did not cover scales for handling baggage. Mr. Lindsay raised the question as to why we preferred the dial scale. That is simply because we can handle so much more over a dial scale than over a beam scale, so that we felt it was proper to recommend the dial scale in preference to the beam scale. That requires a whole lot of attention, but it is more efficient in the end.

(Mr. Long's motion was put to a vote and carried.)

Mr. Long: We recommend with reference to Appendix B that the two paragraphs on platforms be accepted by the convention and published in the Manual, and that the balance of the report be published in the proceedings.

Mr. Ford: As I understand the purport of the chairman's remarks, it is suggested by the committee that all platforms at important terminal stations be made high platforms, and that we recommend that the M. C. B. Association change their passenger equipment to conform with that. That may be all right, but it occurs to me it will be better if this committee would confer with the M. C. B. Association before making this as a specific recommendation from this association. I don't think we are in a position to take a definite stand on it with the information that the committee has given us.

Mr. Long: The committee will withdraw that paragraph and recommend that the last one only be published in the Manual, and that the balance of the report be published in the proceedings.

(Mr. Long's motion was put to a vote and carried.)

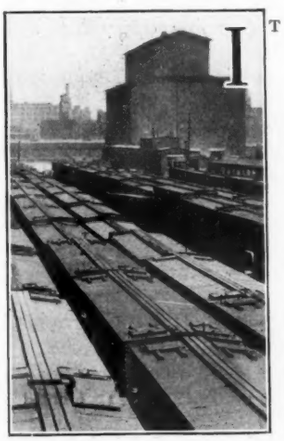
Mr. Long: We recommend that the report on Appendix C be accepted and published in the proceedings, and that the conclusions be published in the Manual.

C. E. Lindsay (U. S. R. A.): It has been my experience that the principal essential to the proper operation of either type is a down-spout of ample dimensions, durable material, and provided with some means of cleaning and thawing it out when it becomes frozen. With such ample down-spout arrangement and such conveniences, the butterfly type is always preferable to the umbrella type.

(Mr. Long's motion was put to a vote and carried.)

(The committee was relieved with the thanks of the association.)

Report on Yards and Terminals



IT WAS THE FEELING of the members that, on account of the war conditions and because of the Federal operation of railroads, "Unit Operation of Railroad Terminals in Large Cities," was of such importance that it could well engross the best efforts and thought of the committee. It was agreed that each member of the committee should familiarize himself with the work, methods and information obtained by the local unification committees in his vicinity, and from this and his own experience be prepared to unite in proposing a complete, logical and practical general method for the proper unification of terminals, as useful as the Committee's Catechism of last year on "War Emergency Yard Improvements." (This catechism was published in the *Railway Age* of Sept. 27, 1918, page 595.)

Intermediate Sorting Yards

The committee is not able to offer anything new on the general subject of classification yards, but has made some inquiry as to practices and given the time of one meeting to the discussion of the particular subject of switching from classification yards to departure yards—especially as regards the use of a small sorting yard located between the classification yard and the departure yard. The committee finds some conflict of opinion as to the advisability of providing such an auxiliary yard, but in so far as it has information, up to this time, provision for such an intermediate yard has seldom been made in yard designs or at any rate in the actual construction of yards.

In some classification yards the sorting of cars into station order or into other similar secondary groupings is accomplished more or less completely by the construction and use of a sorting yard tributary to the hump with its ladder next to the outside track of the main yard and with its short body tracks diagonal thereto. Another method of accomplishing the same thing might be the subdivision of a few of the main classification tracks at one side of the yard by means of intermediate ladders.

The committee thus far is impressed with the thought that generally the secondary sorting of cars into station order, etc., can be accomplished satisfactorily by supplementing the classification accomplished via the hump with flat switching performed by trimmer engines either at the foot of the hump or in the departure yard, thus saving the additional investment, the increased length of terminal district, and the delay to cars that would attend their delivery to and removal from the sorting yard, if such an auxiliary facility were provided.

Nevertheless, there may be situations where the construction of an auxiliary sorting yard will be necessary, because it may be impossible to provide sufficient tracks in the classification yard, or because the number of the cars requiring classification into "set out" or placement order may be too great to allow their switching at the departure end of the classification yard, or in the departure yard, without undue interference with the flow of traffic. Such an auxiliary yard should have a sufficient number of tracks of length to conform with the particular requirements of the situation, and where practicable, with assisting grades. In order to minimize the backward movement of cars this yard might be located between the classification yard and the departure yard at one side of the regular current of traffic between these

yards. In some cases it is probable an alternate location would be alongside the departure yard.

Conclusions

The committee concludes:

1. That the preliminary report on Unit Operation of Railroad Terminals in Large Cities including the Catechism on Unit Operation of Railroad Terminals be published in the Manual of Recommended Practice.

2. That the matter under Subjects 5 and 6 be received as a progress report.

The committee recommends that the subjects of this year be continued for next year.

Committee: B. H. Mann (M. P.), chairman; A. Montzheimer (E. J. & E.), vice-chairman; W. G. Arn, Hadley Baldwin (C. C. C. & St. L.), Miles Bronson (N. Y. C.), G. H. Burgess (D. & H.), A. E. Clift (I. C.), L. G. Curtis (B. & O.), H. T. Douglas, Jr. (C. & A.), A. C. Everham, E. M. Hastings (R. F. & P.), Reuben Hayes (Pa. Lines), D. B. Johnston (Pa. Lines), F. E. Lamphere, H. J. Pfeifer (T. R. R. of St. L.), S. S. Roberts (U. S. R. R. A.), C. H. Spencer (I. C. C.), E. B. Temple (U. S. R. R. A.), E. E. R. Tratman, E. P. Weatherly, W. L. Webb (C. M. & St. P.), A. J. Wharf (P. & P. V.), J. G. Wishart (C. R. I. & P.).

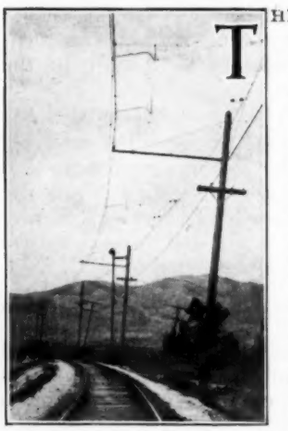
Discussion

B. H. Mann (Chairman): The subject has been included in approximately 150 questions under about 57 sub-heads. It has been requested to include in this year's proceedings a skeleton of a sample organization of a unified terminal.

(H. S. Pfeifer (T. R. R. of St. L.) then read the plan and Mr. Mann moved its adoption. After considerable discussion, none of it relating to the subject matter of the report, but rather on the disposition to be made of it, Mr. Mann withdrew his motion and the report was received as information.)

(The committee was dismissed with thanks.)

Report of Committee on Electricity



THE COMMITTEE last year submitted to the Association a list of technical definitions and the Association tentatively adopted and published them in the Proceedings with the understanding that the membership would have an opportunity to consider and offer suggestions to the committee. The following list of definitions has been revised and is now submitted for adoption and printing in the Manual. These definitions, so far as possible, conform with those in use by the U. S. Bureau of Standards and printed in the National Electrical Code and those of the American Institute of Electrical Engineers. It will be noted that the definitions are arranged in alphabetical order rather than in logical sequence. This has been done with the view of conforming to common usage in the Manual. Words in parentheses after each definition indicate new definitions by the word "proposed" or the source of existing definitions.

Electrical Definitions

Bond.—A metallic means for connecting conductors to permit passage of electric current. (Proposed.)

Bonder.—An employee assigned to install or maintain bonds and their appurtenances. (Proposed.)

Bracket Support.—An arm supporting the trolley wire or catenary. (Proposed.)

Bridge Support.—A rigid overhead structure supporting the trolley wire or catenary. (Proposed.)

Cable Conductor.—Wires bound together acting as a conductor. (Proposed.)

Catenary Suspension.—Any form of trolley construction supported by a longitudinal wire or cable. (Proposed.)

Clearance Line (Equipment).—The line beyond which no part of the equipment shall project. (Proposed.)

Clearance Line (Third Rail).—The line beyond which no part of the third rail structure shall project. (A. R. E. A. Manual.)

Conductor.—A metallic path for the flow of electricity. (Proposed.)

Contact Conductor.—That part of the distribution system other than the traffic rails which is in immediate electrical contact with the circuits of the cars or locomotives. (A. I. E. E. 706.)

Contact Rail.—A rigid contact conductor. (A. I. E. E. 767.)

Contact Rail (Overhead).—A rigid contact conductor above the elevation of the maximum equipment line. (A. I. E. E. 768.)

Cross-Span Support.—Overhead wire or cable supporting the trolley wire or cantenary. (Proposed.)

Direct Suspension.—Any form of overhead trolley construction in which the trolley wires are attached by insulating devices directly to the main supporting system. (A. I. E. E. 780.)

Distributing System.—That portion of the conductor system which carries current of the kind and voltage received by the cars or locomotives. (Proposed.)

Duct Line.—A structure consisting of one or more tubes and chambers for the housing of wires or cables. (Proposed.)

Jumper.—A cable used to connect the ends of two contact conductors. (A. R. E. A. Vol. 18, page 145.)

Patrolmen.—Employees assigned to inspect track and third rail structures, cables and wires. (Proposed.)

Pulling Chamber.—A chamber in a duct line provided for pulling cables and wires into ducts. (Proposed.)

Splicing Chamber.—A chamber in a duct line, in which cables are spliced and inspected. (A. R. E. A., Vol. 18, page 144.)

Substation.—A structure and its contained group of apparatus or machinery which receives current from a transmission system, changes its kind or voltage and delivers it to a distribution system. (A. I. E. E. 762.)

Third Rail.—A contact conductor placed at either side of the track, the contact surface of which is located a few inches above the level of the top of the track rails. (A. I. E. E. 769.)

Third Rail Gage.—Distance measured parallel to plane of top of both running rails between gage of nearest running rail and inside gage line of third rail. (A. R. E. A. Manual.)

Traction Linemen.—Employees assigned to install or maintain wires and cables and their appurtenances for all railroad voltages. (A. R. E. A. Manual.)

Lineman (New).—Employees assigned to install or maintain wires and cables and their appurtenances. (Proposed.)

Transmission System.—That portion of the conductor system carrying current of a kind or voltage different

from that received by the cars or locomotives. (Proposed.)

Transmission Line.—A system of towers or poles and cables or wires carrying current from the source of power to the substations. (Proposed.)

Trolley Wire.—A flexible contact conductor customarily supported above the cars. (A. I. E. E. 777.)

The sub-committee on water power has to some extent investigated the utilization of water power for electric railway operation and has collected some data to indicate to what extent water power is now used to generate electricity for the operation of steam railroads. In the table below are shown the principal steam roads which have been partially electrified, the source of power, and the approximate annual current consumption. In the case of those roads using current generated by steam, the reason why water power was not used is given so far as obtainable.

Electrified Steam Railroads—1917

Line	Miles Electric Track. 1917.	Trolley Voltage.	Kind of Service, Passgr. & Frt.	Power From	KWH. 1917 at Power House for Trains.	Reasons for not Using Water Power.
P. R. R., N. Y....	97	650 DC	P	Coal	64,290,840	None available
L. I. R. R., N. Y..	208	650 DC	P	"	97,382,970	None available
P. R. R., Phila....	95	11000 AC	P	"	23,100,360	None available
W. J. & Seashore.	150	650 DC	P	"	32,825,600	None available
Grand Trunk.....	12	3300 AC	P&F	"	3,913,300	None available
Nor. & Western...	90	11000 AC	F	"	56,651,700	Coal cheaper
New York Central.	253	650 DC	P	"	102,585,000	None available
N. Y., N. H. & H.	530	11000 AC	P&F	"	90,500,000	Some water pr.
M. C., Detroit....	25	650 DC	P	"	7,431,000	None available
Hoosac Tunnel....	21	11000 AC	P&F	Both	7,727,000	
B. & O., Baltimore.	8	650 DC	P&F	Water	6,200,230	
C., M. & St. P.R.R.	600	3000 DC	P&F	"	124,600,000	
B. A. & P.....	90	2400 DC	F	"	23,408,270	
Erie (Roch. Div.).	38	11000 AC	P	"	1,894,860	
Great Northern....	10	6600 AC	P&F	"	4,080,000	
Southern Pacific...	138	1200 DC	P	"	27,844,000	
Total 2365					675,000,000	

The development of any water power for a certain kilowattage should require that the combination of stream flow and reservoir capacity is capable of developing the same kilowattage throughout the year. In the Middle Atlantic and New England states, within a reasonable distance—not to exceed 200 miles of any railroad having a dense traffic and excluding Niagara Falls—the streams where an appreciable head is available are erratic as to stream flow. A small amount of power can be developed economically, but to develop an amount reasonably to be expected from a central station requires either a reservoir or an auxiliary steam station. The result of this is usually a plant in which the capitalization is so excessive that, in spite of the low operating cost, electrical energy cannot be produced at a price to compete with that generated in an all-steam station of like capacity, and economy.

A concrete example of fuel saving by the substitution of electric for steam operation where comparable statistics are available is the electrification of the Chicago, Milwaukee & St. Paul between Avery, Idaho, and Harlowton, Montana, a distance of 440 miles and comprising an electrification of 600 miles of track. During 1917, 124,000,000 K.W.H. (equivalent to approximately 3,900,000,000 ton miles) were generated by water power for the operation of trains. Based upon actual records taken prior to electrification, 220,000 tons of coal and 453,000 barrels of oil (equivalent to a total of 350,000 tons of coal) were burned under locomotives for an equivalent steam service. In 1917 there were 2365 miles of steam railroad under electric operation in the United States and it has been reported to the committee that during the year there were 675,000,000 K.W.H. generated for the operation of trains over these electrified tracks. Applying the figures obtained from steam and electric operation of the Chicago, Milwaukee & St. Paul Railroad to all of the roads electrified, would result in a saving of 1,890,000 tons of coal per annum, had it been possible to produce all of this electrical energy by water power.

A concrete example of fuel saving, where coal is used to generate electric power, is furnished by the Norfolk & Western electrification of about 90 miles of track between Bluefield and Vivian. During the year 1917 there was generated 56,652,000 K.W.H. for the operation of trains, using 87,160 tons of coal at the power house. Based upon records of coal consumption on steam locomotives on the Norfolk & Western, 147,600 tons of coal would be required for an equivalent steam service. Applying a similar saving to the 2365 miles of electrified steam railroads would show a saving of 720,000 tons of coal per annum if all electric energy had been generated by steam power plants.

The total developed water power of the United States is reported by the Secretary of Agriculture in 1916 as 6,500,000 H.P. The undeveloped water power is reported in Senate Document 316, dated 1916, as 53,900,000 H.P., of which 39,200,000 H.P. is within the limits of the Rocky Mountains and Pacific Coast states.

Calvert Townley in a statement to a committee of the United States Chamber of Commerce on January 14, 1918, made in behalf of the Engineering Council, calls attention to the fact that the federal government still retains as proprietor more than two-thirds of the total area of the 13 western states in which the bulk of the undeveloped water power is located. If any parts of the public lands are needed for reservoirs, dams, transmission lines, etc., a permit of the Secretary of the Interior is required, which is revocable at any time, without cause. Other water powers are on navigable streams, and require an Act of Congress for their development. A revision of these laws is under consideration. Outside of the western water power states and the territory tributary to Niagara, water power generally should be developed with auxiliary steam power.

Conclusions

(1) It is important to reduce the use of coal where possible by the development of water power.

(2) Water power will show the greatest economy in the West on account of the higher cost of coal and minimum cost of water power development, but may show economy in other districts at present or future coal prices.

(3) In general, auxiliary steam plants should be built, to develop the water power beyond its minimum capacity, and to secure reliability of service.

(4) Laws should be modified to permit the development of water power on public lands and on navigable streams, under reasonable restrictions.

(5) In its studies and investigations of this subject the committee have been impressed with the failure of some of the carriers to so keep their records as to permit the proper segregation of data which is necessary to calculate the tons of coal consumed in steam locomotives separated from coal consumed for other purposes on sections or divisions where electricity has been substituted for steam.

Recommendations

The committee recommend the following for your action:

(1) The adoption and publication in the Proceedings and in the Manual of the electrical definitions, and continue the examination of the subject-matter in the Manual pertaining to Electricity.

(2) Continue collecting statistical data relative to clearances of third rail and overhead working conductors, and submit revised tables at the next annual meeting.

(3) Continue the subject of the revision of joint specifications for transmission line crossings over railroad companies' right-of-way and send delegates to co-operate with committees of the American Railroad Association and of the American Electric Railway Engineering Association and the United States Bureau of Standards.

(4) Continue the subject of electrolysis and insulation and send delegates to co-operate with the American Committee on Electrolysis in the preparation of its future report.

(5) Continue the subject of maintenance organization and relation to track structures.

(6) Accept as information and publish in the Proceedings the report on water power. In this connection the committee desires to call attention to the fact that it has found but little data bearing on the cost of steam railroad operation applicable to divisions where electric operation has been established, and urge upon engineers and accounting officials the desirability of so arranging the accounts as to accurately show the cost of steam operation and that such accounts be available before attempting to compute the cost of electric operation.

(7) Accept as information and publish in the Proceedings the report on Electrical Interference, and continue the subject.

(8) Accept as information and publish in the Proceedings the committee's report on the National Electrical Safety Code, and continue co-operation with the United States Bureau of Standards in the preparation of Safety Codes.

(9) The acceptance and publication in the Proceedings of the report as a whole.

Committee: Edwin B. Katte (N. Y. C.), Chairman; A. G. Shaver (Cons. Engr.), Vice-Chairman; A. H. Armstrong (Gen. Elec.), H. M. Bassett (N. Y. C.), Z. M. Briggs (Pa. Lines), D. J. Brumley (I. C.), H. M. Church (B. & O.), C S. Churchill (N. & W.), R. D. Coombs (Cons. Engr.), Walt Dennis (Wab.), R. H. Ford (C., R. I. & P.), W. F. Graves, G. W. Kittredge (N. Y. C.), C. E. Lindsay (U. S. R. R. A.), H. K. Lowry (C., R. I. & P.), W. L. Morse (N. Y. C.), W. S. Murray (Cons. Engr.), Frank Rhea, J. R. Savage (L. I.), M. Schreiber, H. U. Wallace.

Discussion

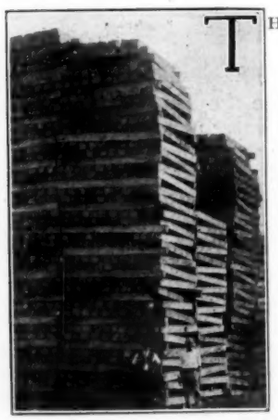
(E. B. Katte (Chairman) introduced the report and it was accepted as a whole for publication in the proceedings.)

(Mr. Katte then introduced Mr. Wagner of the Bureau of Standards.)

M. W. Wagner (U. S. Bureau of Standards): I would like to have everyone here today familiar with the present status of the National Electric Safety Code. We have a proposed revision of it, which deals with overhead and underground circuits of all kinds. We have submitted it from time to time to those who are vitally interested for suggestions as to positive changes to be included in this revised copy and we are receiving suggestions which are of great value. This proposed revision has been submitted to a number of conferees who are to go over it and give us the benefit of their criticism. We are about to receive these criticisms and comments, and as soon as they are in and the various suggestions have been boiled down, it is likely there will be a conference held in Washington or New York, or some other easily accessible place, where further discussion and criticism will be given. After that, a lithographic copy of the revision will be issued, which will show wherein changes are made. We hope to submit this to a general conferee list. If there are any members of this association who would like a copy of that report, we will send it.

(The committee was dismissed with thanks.)

Report of Committee on Ties



THAT SCREW SPIKES prolong the life of ties over that obtained with cut spikes was the opinion on 27 out of 29 railroads that reported in 1914. Three years later a committee for the Pennsylvania Railroad finished an investigation on this subject, which it had conducted for 9 years, and agreed upon the following statement: Screw spikes have no advantage over nail spikes. When used with clips without tie plates, the cutting of the rail into the tie permits the rail to slip under the clip, thus widening the gage." As a result of these diverging opinions, the committee has tried to find the present general opinion among railroads on this subject, in the hope that it could summarize the practice and distinguish the conditions under which either form of track connection was the better as regards the durability of the ties.

For this purpose, a list of questions was sent to 75 railroads. From these, 58 have replied, and of these 58, 52 stated either that they had never used any screw spikes, or else that their trials had been so limited that no conclusions could be formed. Of the other 6 replies, 2 railroads believed that screw spikes permitted a longer life of tie than cut spikes. Three railroads reported that screw spikes did not permit longer life of tie than cut spikes. One electric elevated and subway road reports that screw spikes do prolong the life of ties. Two railroads believed there was no reason for using screw spikes unless the ties were bored and treated before the screw spikes were applied. Six railroads considered this unnecessary. Eight railroads believed that a screw spike should not be used as an anchor, and that it should be kept free from the slots in the angle. Five railroads considered that it should be used as an anchor and put in the slots in the angle. One railroad used some device to put in the spike hole to make the screw spike secure again after it had become loose, or after the chamber around it had decayed. Eleven railroads used no such device.

As a result of these diverging opinions, it is the opinion of the committee—

(1) That there is not sufficient data available, due to lack of general use, to show that the use of screw spikes will increase the durability of ties, except under special conditions.

(2) That there may be specific forms of track construction where screw spikes prolong the life of ties such as on elevated structures, and so-called permanent track where there is a more substantial foundation provided than on ordinary tie and ballast track.

Methods for Controlling Tie Renewals

Our study of the replies to inquiries in last year's investigation of methods for controlling tie renewals indicates a wide divergence of methods under apparent similarity of organization and physical conditions.

This suggests the possibility of developing a uniform method of determining the essentials necessary to control tie renewals, namely:

(1) Preliminary physical inspection of ties in track —based on a predetermined renewal standard.

(2) Field checks of the preliminary inspection in whole or in part.

(3) Utilization of statistics as a further check on tie renewals and the determination of final allotment.

(4) Checking results obtained.

The tabulations of replies received from 100 railroads with an aggregate mileage of 223,000 would indicate that there are three general methods for determining the number of ties to be renewed.

(a) Field inspection by section foremen, supervisor or roadmaster.

(b) Inspection by tie inspector.

(c) Determination by statistics.

Evidence should be obtained to disclose which method is best suited to local conditions and the type of organization to insure following predetermined standards of renewal and avoid divided responsibility for safe maintenance. The information at hand does not indicate the best methods of obtaining effective field checks to secure economy and safety. The question arises as to the relative importance of statistics as compared to field inspection as a further check on tie renewals. The best methods of final allotment of tie supply should be further developed. It is evident that an inspection of ties removed from track affords the best means of checking extravagance and placing the responsibility for same. This leads to the determination of the best method for making an independent check and devising means for determining and avoiding inadequate renewals.

The usual report on trials of substitute ties was included.

Conclusions

(1) The committee recommends that forms Nos. M. W. 301, 302, 303, 304 be withdrawn from the Manual.

(2) That the report on the effect of the design of tie-plates and track spikes on the durability of cross-ties be received as information.

(3) That the report as to methods in use by various railroads for controlling tie renewals be received as information.

(4) That the report on substitute ties be received as information.

Committee: F. R. Layng (B. & L. E.), chairman; H. S. Wilgus (P. S. & N.), vice-chairman; W. C. Baisinger (A. T. & S. F.), M. S. Blaiklock (G. T.), F. T. Beckett (C. R. I. & P.), E. Boardman (N. Y. C.), W. J. Burton (M. P.), W. A. Clark (D. M. & N.), S. B. Clement (T. & N. O.), E. L. Crugar (I. C.), L. A. Downs (I. C.), G. F. Hand (N Y. N. H. & H.), E. D. Jackson, A. J. Neafie (D. L. & W.), G. P. Palmer (B. & O.), Louis Yager (N. P.).

Discussion

F. R. Layng (Chairman): The first subject which we report on is the effect of the design of tie plates and track spikes on the durability of cross-ties. The second subject is the methods in use by various railways for controlling tie renewals. Committee No. 6 gives a report on trials of substitute ties. This is offered as information. I move that these reports be received as information and published in the proceedings.

G. J. Ray (U. S. R. A.): We went into the screw spike proposition for the primary reason of saving ties. We thought we would be able to treat a certain class of ties and establish good long life. One thing which I mentioned in my report is that the use of an inferior class of pine tie is not advisable on a heavy traffic road, and the screw spike does not materially lengthen the life of that tie. The standardization of the thread on the spike is another important thing. You realize if you put a screw into wood and extract it immediately and insert another screw of the same diameter of shank but with a different thread, you immediately spoil the threads in the wood and after this has occurred a couple of times you can pull the screw out with your fingers. Some of the errors made in connection with the screw spike are due to that very cause, and some of the opinions expressed on its efficiency which this committee must pass on are based on such information. Two main points are whether screw spikes will increase the durability of the ties, on which there is not enough information available, and on the second point there is some doubt in the mind of the committee whether on a more or less yielding roadbed the screw spike is not a failure.

In the fall of 1911 the Lackawanna put into service what was known as the Hopatcong cut-off, 30 mi. of double track over which the main line traffic of the Lackawanna is hauled. The rail was laid on creosoted pine ties, red oak, maple, beech, gum, and a little of everything. We have taken out possibly 30 or 40, or perhaps 100 ties. We had ties in which we could remove the spikes with our fingers as they had a shell of a half inch and were rotten in the center. Outside of these cases there were no screw spikes that were loose after eight years of service. I do not feel that we will be able to give much definite information on the effect of the screw spike on the other ties for a matter of five or seven years.

When we first considered creosoting ties, the problem was to get the full benefit out of the additional expense of treating. From our experience with bridge ties and all sorts of flange plates, we came to the conclusion there was no use in putting a creosoted bridge tie on our railroad with a flanged plate. We would have torn the ties all to pieces before they were worn out, and we felt we must go to the flat-bottomed plate. We have a lot of curvature on the road and did not want to take any chances with the flat-bottom plate unless we had something else to hold the plate in place, and hold the rail, and we went to the screw spike to save the tie from mechanical wear. We put in machines and adzed and bored the ties before they were treated, to insure this protection beforehand and prevent the destruction of the timber by cutting wood which is not properly treated. We believe we are getting good results from using the screw spike.

On this particular line that I speak of we laid part of the line with 91-lb. Lackawanna rail, rolled in 1910. The rest of it was 101-lb. section rolled in 1911. We have had less rail failures on that line than on any other part of the railroad, notwithstanding the fact that we have settlements as great as three feet on some parts of this road. The question of settlement so far has not had any serious effect on the results on that particular line. Our present cost of maintenance is the best evidence in the world that we have made no mistake on the screw spike. During the first 10 months of the year 1918, figures given out by the Administration show that the Lackawanna was the only road which had not very materially increased its maintenance expense. That may not have been due to the screw spike altogether, but I am very sure it did not have any bad effect on the result.

F. Boardman (N. Y. C.): The committee was confronted with an almost unanimous report from the roads of whom they asked these questions that they did not believe in screw spikes. They had, on the other hand, the very successful installation on the D. L. & W. and on one or two other roads. In making these adverse criticisms in the report, there were a number of specific reasons given. It was the opinion of the committee that with the information before them, it was not proper to make a general statement that screw spikes were desirable in

spiking down ties unless standards of construction and maintenance were also specified. Among other things we asked for was a detailed report from the D. L. & W. road, which is now being gotten up to answer these specific objections.

Mr. Ray: I did not intend in what I said, any criticism of the committee's work. I expected just such a report. How are you going to plug a rotten tie, and that is one of the vital questions we have to face. If for any reason a spike does get loose we have two more holes in which to replace it. Our only difficulty has developed with reference to curved conditions. We have absolutely none on straight track.

C. W. Baldridge (A. T. & S. F.): The Santa Fe has put in probably 100 miles of track with screw spikes, and if you ask Mr. Rex of the tie department what results you get, you will get one answer, and if you ask me you will get another. This question has been pretty well handled by the committee up to the present time, and from their study there is nothing to prove that the screw spike is of any benefit in protecting the tie.

C. E. Lindsay (U. S. R. A.): The committee has submitted a report on methods in use which are comprised in field inspection and post-mortem examination. Certainly the conditions of the present season will necessitate an even greater use of preliminary field inspection if railroads are to be maintained in proper condition to approach the succeeding winter. I have always advocated preliminary field inspection, coupled with an arbitrary rule that no section foreman should be allowed to put in more than a designated number of ties per rail length without asking for inspection by his superior and I have had most excellent results from that method. The ordinary foreman will open up his track where he has a tie which he considers proper to remove, and will find that the tie alongside it is getting soft, and while he is at it will think he might as well take out the two ties instead of one, unless some check is placed upon his action. I would seriously urge upon the committee the study for the succeeding report of the subject of definite methods that should be followed of preliminary inspection, rather than post-mortem examination.

(Mr. Layng's motion was then put to vote and carried.)

Mr. Layng: The committee last year canvassed the association and found that forms 301, 302, 303 and 304 were not being used by the members and it was further stated in these replies that there was no prospect of their being used. The committee therefore recommends that these forms be withdrawn from the Manual. Mr. Chairman, I so move.

Mr. Lindsay: I would like to ask if the committee discovered from their replies received what the objection was to these forms?

Mr. Layng: One reply that I recall suggested that it would be necessary to have a clerk on each section, in order to keep up the forms. Most of the replies simply said that they were not being used.

Mr. Safford: I would certainly vote no on that. I don't believe we should withdraw forms from the Manual that have been developed after some years of study by the committee, merely because we find that they are not in general use.

The Chairman: If that same principle was applied generally, we would not have much of our Manual left, I am afraid.

Mr. Lindsay: I move you that the forms be referred to the committee for reconsideration. (Motion carried, and the committee was relieved with the thanks of the association.)

Report of Committee on Ballast

FOR SUBJECTS FOR the consideration of the Ballast committee in 1919, we recommend the following:

(1) Report on proper depth of ballast of various kinds to insure uniform distribution of loads on the roadbed, conferring with the special committee on Stresses in Track and the committee on Roadway.

(2) Report on methods and comparative cost of applying ballast, giving special attention to the organization of the ballast gang.

(3) Study and report on the design of gravel washing plants. Study and report on the design of stone crushing plants.

(4) The use of reinforced concrete slabs or other devices to assist the ballast in distributing the load on soft roadbed.

Methods and Comparative Cost of Applying Ballast

Realizing the stress under which all railroad men would be working, the committee confined itself to the organization of the ballast raising gang, only touching incidently upon cost or work preparatory for and subsequent to the putting in of the ballast.

A circular letter was sent out to the roads represented in the association to which letter was attached the tentative diagram presented to the association at its last annual meeting in March. Representatives of the carriers were requested to furnish the committee with a diagram similar in form showing their typical ballast gang, together with a brief narrative description of the method of using the gang to the best advantage, and any cost figures they might have available. Some few replies have been received and they have led the committee to modify the tentative diagram, principally in the way of increasing the number of jackmen, forkers and tampers and restating the flagging requirements.

Notes have been added calling attention to certain matters, among others the fact that upon old track in commercial service, another gang would be required to prepare the way for the ballast-raising gang. It is understood, of course, that a finishing gang will follow the ballast gang, after the ballast has been consolidated under traffic, to put the track in proper surface and line, dress the ballast section, dress shoulder, etc.

Some suggestions in the way of detail methods have been made, as follows:

It is helpful to number the men and chalk their numbers on the rail over the particular ties these men are to tamp. The New York Central and the Santa Fe both say it pays in the quality of work obtained.

The Norfolk & Western suggests that the head flagman, whose duties will be light, can tighten bolts and in some instances dig jack holes. The rear flagman can put on rail anchors and tidy up without interfering with his job. This presupposes that the flagging will be done by one of the ballast gang as would be the case on a new

line. If regular trainmen are used on an operated line, such work presumably could not be required from them.

Several comment that a tamping spade, heavy and narrow, is better than a pick or bar for the first tamping after a raise.

Agreement is pretty general that on an operated track, an advance gang digging out spent ballast, widening shoulder, renewing ties and making general preparation for the spreading of the new ballast, should be handled as a separate unit well in advance of the ballast gang. If track has to be lowered under overhead obstructions, bank widening is required or similar work has to be done. This preliminary work may require a large force and special facilities.

Opinion seems to be divided whether the lifting jacks should be worked in a bunch or in two sets a short distance apart as recommended by the committee.

The Pennsylvania Railroad suggests that on new construction the tampers should be spread out more than indicated on the diagram.

Suggestions have been made that the head jacks should be heavy No. 6's, which weigh 99 lb. and would require two men to a jack instead of one. The committee has accepted the suggestion and modified its diagram accordingly.

The committee realizes that circumstances must govern, and any typical organization must be modified to meet local conditions. The diagram is submitted as a guide and as representing good practice under average conditions.

Conclusion

The diagram as presented should be published in the Manual as representing good practice in the organization of a gang to raise track on new ballast under normal conditions.

Gravel Washing and Stone Crushing Plants

At first it was thought possible to design a general plan and give brief description or specifications for several typical stone crushing and ballast washing plants; but when local conditions were taken into consideration, it was found practically impossible to design such typical plants which would fit all local conditions.

It was, therefore, decided that probably the most helpful method of handling this subject would be to include in the Proceedings a general plan and brief description or specifications of any successful plants which could be obtained. Therefore, some 30 carriers were circularized with regard to the design of these plants, and 14 answers were received; but due to the conditions prevailing during the war, it was impossible to get much information upon this subject. Five plants were described and illustrated, which, together with other gravel washing and stone crushing plants, previously described, the committee considers the nucleus to which additional similar data may be added as acquired.

Method of Cleaning Stone Ballast

The committee was fortunate in obtaining from W. C. Cushing, chief engineer of maintenance, Pennsylvania Lines West of Pittsburgh, a copy of the descriptive instructions of two methods of cleaning stone ballast, which were issued in 1915 to certain division engineers to be followed as a part of the regular ballast cleaning program of that year. Mr. Cushing advises that, due to unsatisfactory labor conditions, conclusions have not yet been reached, and until the supply of labor permits the railroads to return to a more normal condition, it is probable that very little can be learned from a comparative test of these methods.

The instructions in question follow:

Instructions for Cleaning Ballast

Not in Connection with Tie Renewals

The space between the ties (cribs) is to be cleaned to the bottom of the ties, the space between tracks to be cleaned to 6 in. below the bottom of the ties, and the shoulders outside of the ties to be cleaned down to the top of the sub-ballast, where any. Where there is no sub-ballast, clean to the sub-grade. Every 50 ft. one crib to be cleaned out to a line, on a uniform grade between the bottom of the center ditch and the sub-grade outside the track to form a cross drain from the center ditch.

Under the ordinary fork method, the ballast is to be cleaned in the usual manner by shaking the ballast on forks and throwing the cleaned ballast remaining on the forks back into the track, and the small particles of ballast and dirt which pass between the tines of the forks to be disposed of by throwing it over the bank, or by any other way that may be expedient. When the dirt can be disposed of by throwing over the bank, its cost may be included in with the cleaning. When it is necessary to move the dirt any distance it shall be thrown into piles and the cost of doing so included with the cost of cleaning, but the cost of removing it afterward shall be kept separate and not made a part of the cleaning cost.

Under this method of cleaning it will not be necessary to use a definite number of men in the gang, but it should not be extra large, nor very small. On double track there should be three men in each sub-gang; one on each berme and one in the center. The man in the center to work to the right or left as needed, and those on the sides to work in through the cribs to meet him. The sub-gangs to be started about 100 ft. apart. Thus, with a gang of 12 men they would be spread out over about 300 ft. of track. When starting, the ballast removed will have to be piled up until a space about 3 ft. is cleaned, after which the shaken ballast can be thrown directly back in the 3-ft. space.

For the Trench-Zepp method 3 screens are to be used with a force of 12 men and a foreman, distributed as follows: Two men to shovel from each shoulder to their respective screen; two from the center into the center screen, and one man in the center of each track shoveling into the screen most available; one man with a pick working ahead to loosen hardened ballast, and three men, one for each screen, to dress down the ballast on the center and shoulders, form a uniform ballast line and dispose of the dirt. When the dirt can be disposed of by throwing over the bank, its cost may be included in with the cleaning. When it is necessary to move the dirt any distance it shall be thrown into piles and the cost of doing so included with the cost of cleaning, but the cost of removing it afterward shall be kept separate and not made a part of the cleaning cost. When necessary, a water boy in addition to the twelve men can be employed. In operation, the center screen will work ahead of the side screens, and the man attached to this screen will work ahead of the side screens, and the men attached to this screen will clean out the cribs, to about one foot inside of the inside rails of the double track.

In Connection with Tie Renewals

Under the ordinary method such ties as are spotted are to be renewed in the ordinary manner with the ordinary sized force, but a record of the cost to be kept, for use in comparing this method with the screen method.

By the screen method such ties as are spotted are to be renewed by a force of eight men and a foreman with one screen, and a water boy if thought expedient. The force is to be distributed as follows:

One man picking ballast loose ahead of the bank.

Three men digging the ballast out of the track and throwing it onto the screen.

One man removing the refuse and straightening up the ballast.

Two men removing the spikes, taking out the old tie, putting in the new tie and spiking.

One man following up about 300 to 400 ft. in the rear, putting ballast in around the tie and trimming up the track.

All the ballast on the shoulder and in the cribs is to be taken out, but not from the center between tracks (this can be cleaned at another time). Where only one tie is to be renewed clean out the cribs on both sides of the tie. When two ties are to be renewed clean out the crib between the two ties and one crib on the outside of each tie or three cribs. When three ties are to be renewed clean out four cribs, etc.

The work to progress as follows: The first man with a pick will proceed to pick loose the ballast where ties are spotted. The three men cleaning out the ballast from track will follow about 12 ft. behind and shovel onto the screen. The one man in charge of the screen will see that the ballast falls onto the track, into pans, or on the outside shoulder, as may be deemed best in each case, for re-use in tamping the new ties. It is left in this shape until the two men who are putting in the ties come along. They will take out the spikes, remove the old tie, put in the new tie and tamp immediately, leveling off enough ballast into the cribs to make the track safe. The man who follows up in the rear is not started until the other force has proceeded far enough to allow as many trains to go over as may be deemed necessary by the foreman to settle the ties and permit of proper retamping, the idea being that the retamping after traffic has gone over it will all be done before the ballast is filled in to its proper section, so that it will not be in the way of tamping.

A record of progress and cost is to be kept and signed by the foreman.

Committee: H. E. Hale, chairman; J. M. Meade (A. T. & S. F.), vice-chairman; C. B. Baldridge (A. T. & S. F.), J. S. Bassett, W. J. Bergen (N. Y. C. & St. L.), Theo. Bloecher, Jr. (B. & O.), H. E. Boardman (N. Y. C.), C. J. Coon (N. Y. C.), T. W. Fatherson, G. H. Harris (M. C.), F. A. Jones (M. P.), J. S. McBride (C. & E. I.), William McNab (G. T.), S. B. Rice (R. F. & P.), H. L. Ripley (N. Y. N. H. & H.), Paul Sterling (N. Y. N. H. & H.), B. B. Shaw (C. R. I. & P.), F. J. Stimson (Pa. Lines), D. W. Thrower (I. C.), D. L. Sommerville (N. Y. C.), W. K. Walker, R. C. White (M. P.), W. D. Williams (Cin. Nor.).

Discussion

H. E. Hale (Chairman): The diagram gives an outline of a proposed ballast gang. It is recommended that this diagram be published in the Manual as representing good practice in the organization of the gang to raise track on new ballast under normal conditions. I move the adoption of the diagram as a guide.

J. E. Willoughby (A. C. L.): The diagram provides for a force of 71 men, and a total force of 77 all told. That seems to be a pretty large force. We have got fairly good results out of a gang of 25, and I do not know whether the committee ascertained the fact that 71 men would be an economical gang to operate. I have no objection to the report, or the diagram, if the committee has ascertained that that number is the proper number, although I do not think it would be altogether suitable to some sections of the country.

Mr. Hale: The committee could not obtain data giving the most economical gang, largely due to the effect of different local conditions, and the methods of accounting made the figures such that it was difficult to compare them, but the committee felt that this size gang was in its opinion an economical gang, felt that it could be reduced if it was desirable to do so.

R. H. Ford (C. R. I. & P.); Does the committee recommend a total force of 71 men, irrespective of the weight of rail or track conditions?

Mr. Hale: We have made no difference as far as weight of rail is concerned, but we feel that local conditions would vary the conditions to some extent. The diagram is to be a guide or recommended practice. Probably local conditions will affect it materially.

Mr. Ford: I think the committee might change the title and make it—"A suggested diagram for a force of 77 men," without leaving the inference that a force of 77 men is the proper force for raising track.

Mr. Hale: The committee will accept a change in the title—a suggested diagram is what the committee really had in mind.

The Chairman: I would ask the members if it is desirable to put into the Manual a chart for a gang organization such as this, or should it not be adopted when it becomes a number of a series.

Mr. Hale: The suggestion of Chairman Stimson is in the right direction, but in the absence of any diagram in the Manual, the committee would like to see at least one diagram put there.

C. E. Lindsay (U. S. R. A.): The instructions to the committee were: "Report on methods and comparative cost of applying ballast, giving special attention to the organization of the ballast gang." They have merely taken the organization and reported on that, without giving accompanying data of costs and methods. I believe one should not go into the Manual without the other.

Mr. Hale: The committee made an endeavor to get costs without much success. We appreciate the fact that the subject is not completed. This is in the nature of a progress report, and we want to carry it over. The committee felt there were two separate propositions, organization and cost. While they are related, they are distinct parts of the question referred to. The committee felt they had at least studied the subject enough to recommend one organization of a track gang.

(Motion to accept the recommendation of the committee carried.)

Mr. Hale: Two other subjects were assigned to the committee: study and report on design of gravel washing plants and study and report on design of stone crushing plants. Your committee thought at first they could probably design a typical plant, but as soon as we started we were confronted with the fact that the local conditions were so important we were unable to design anything along that line, and we thought possibly it would be more helpful to the association to pick out efficient plants, which were in operation, giving photographs or drawings sufficient to describe them and, if possible, the original cost and the cost of washing the gravel.

Mr. Ford: A more comprehensive study of the question of ballast is desirable, and we should have a specification as to what ballast is and what it consists of.

Mr. Hale: We were able to get from Mr. Cushing of the Pennsylvania Lines West, instructions for the cleaning of ballast. The committee thought they were interesting enough to bring to the attention of the association. We were also able to get information in connection with reinforced concrete slabs to assist the ballast in supporting the track on soft spots. We are indebted to Mr. Bowser of the Queen & Crescent for a copy of his report. The committee recommends that this be assigned as one of the subjects for further consideration.

(The committee was relieved with the thanks of the association.)

Trade Acceptances for Railway Supply Companies

(From Our Washington Editor)

Representatives of the Railway Executives Committee have been conferring with the Railroad Administration regarding the form of the proposed warrants to be issued for money due to the railway companies; the subject will be considered further at a conference between Director-General Hines and the Railway Executives' Committee on Thursday, when it is hoped that a definite decision will be reached. This meeting was to have been held on Wednesday. Arrangements for paying for the $286,000,000 worth of equipment ordered last year are practically complete. A committee headed by F. N. Hoffstot, president, Pressed Steel Car Company, is working on the details of trade acceptances to be given by the Railroad Administration and is arranging for the presentation of drafts by the equipment builders and specialty manufacturers.

Banquet of the American Railway Engineering Association

Annual Dinner of the Engineering Association

Abstracts of Addresses at the Twentieth Annual Dinner Held in the Gold Room of the Congress Hotel Last Evening

THE TWENTIETH ANNUAL DINNER of the American Railway Engineering Association was held in the Gold Room of the Congress Hotel last evening with Vice-President Earl Stimson presiding in the absence of President C. A. Morse, who was confined to his room with a cold. The speakers included United States Senator Atlee Pomerene of Ohio; Dr. George Adam of Emmanuel Congregational Church, Montreal, Canada, and Robert J. Cary, general counsel, New York Central Lines, Chicago. Hon. Charles N. Goodwin of Chicago, who was scheduled to speak on the Americanization Problem of the Railroads, was detained at his home at the last minute by illness. Abstracts of the addresses are given below.

Some Phases of the Railway Problem

Senator Pomerene, in speaking on this subject, said in part:

The ramifications of the railroads run into every activity of life. The public cannot do without them, and they cannot do without the public. The prosperity of the one means the prosperity of the other; the crippling of one, the crippling of the other. Vitally they are a part of us. They are the veins and arteries through which course the blood of commerce. When we come to treat with them, I submit that they should have the best thought, and the best skill, of the best-trained experts in the land, whether in the field of transportation, finance or legislation. Practical men are needed for the job—not dreamers, not the theorists, not the reactionary who always looks backward and never forward.

LEGISLATION

In considering what ought to be done with the railroads, let us bear in mind the following well-established facts:

1. The three years preceding government control were the most prosperous in the history of our railroads.
2. Before the war period the railroads of the United States gave the public the best service in the world.
3. The per-ton-mile cost to the shipper was cheaper in this country than in any other country in the world.
4. The wages of the employees, though they were too low, were higher than the wages paid by any government-owned roads anywhere in the world. And lest this statement may be misunderstood, I want to make it perfectly clear that, generally speaking, the railway men were justified in asking the raise in their wages which they demanded prior to the period of government control, and which were given to them after government control began. Whether we shall hereafter have government ownership or private ownership, the same rate of wages, relatively speaking, as compared with living costs, should be maintained.

SALARY REDUCTIONS

One of the sops to Cerberus which has been handed to the public is the fact that among the economies of government ownership the director-general's office has saved $6,115,000 in salaries to officials and to counsel. We are told that many officers in the great campaign for economy were separated from their high salaries. That may be so. I assume it to be so. But I also know that the director-general has on his staff, among others, 72 officials drawing from $10,000 to $50,000 each per annum. Five draw $50,000, two draw $40,000 each, three $35,000 each, two $30,000 each, eight $25,000 each, eleven $20,000, and the 72 draw salaries aggregating $1,398,000, or an average of $19,418.05.

SOME GENERAL ORDERS OF THE DIRECTOR-GENERAL

The Railroad Control Act provides that "actions at law and suits in equity may be brought by and against such carriers, and judgments rendered as now provided by law; and in any action at law or suit in equity against the carrier *no defense shall be made thereto upon the ground that the carrier is an instrumentality or agency for the Federal Government.*" The Congress believed this language was about as clear as it could be made. Nevertheless, the director-general of railroads issued the

famous, or rather infamous, order, the effect of which, if legal, is to set aside this act of the American Congress, as well as the Carmack Act. Another order, No. 50, is equally reprehensible.

Let me call your attention also to another order, No. 57, relating to the shipment of grain. It is a principle of law, not to say of common sense, that when a shipper calls for a car in which to ship grain, it will be reasonably fit for the purpose for which it is intended. There can be no doubt about that principle. Every railroad and every shipper have acted upon it; and yet the director-general's office issued Order No. 57 placing upon the shipper the burden to inspect the car and ascertain whether or not it has any leaks.

Granting that the director-general had the power to issue all of these orders, I submit that it was bad policy to issue any of them. Not one of them was issued out of regard for the convenience of the public. Not one of them helped to win the war. All of them added to arousing a spirit of discontent among the people. I deny that the director-general had the power to issue these orders repealing statutes, but if he had the power, right policy should have forbidden it. This is a democracy. We live in America. We do not live in Russia, and we will not submit either to the rule of the Czar or the Bolsheviki.

Government Control

I submit, irrespective of whether you are a believer in government ownership or private ownership, to ask the right to hold the railroads five years without giving to the owners any assurance of what will be done, lacks the one fundamental principle that should control a government in all its actions, namely, to deal honestly and fairly with its people.

The following changes during government control seem to be generally approved:

1. The general advance in wages.
2. The joint use of terminals.
3. Greater interchange in use of equipment.
4. Greater control over the routing of freight.
5. Greater unification in the control and operation of the roads, or, to put it in another way, fewer railroad companies.

I believe the public recognizes these general changes necessary and proper. They have been advocated for several years by all students of the subject; and, speaking especially of greater unification of operation and control, believers in government ownership expect this result to follow if the roads are absorbed by the government. Those who are opposed to government ownership likewise believe it is necessary in order to bring about greater economies and better service for the shipping and traveling public. So far, then, as these particular changes in operation are concerned, government control under the director general has proven nothing new.

Every one concedes that the last year of government control has not been a fair test of government ownership, and every fair-minded man will admit that the last year of private operation, hampered as the railroads were by restrictive legislation and demands of the war, was not a fair test of the capacity or efficiency of private ownership and operation. I recognize the fact that there is revolution in the air. I know there is a very general feeling of unrest; but I submit that after the transportation systems have been developed to their present state under private ownership, and we have created a plan of regulation through the Interstate Commerce Commission and the various state commissions, common prudence will suggest that because its railroads do not properly function we should not tear down over night the old structures, stone from stone. Rather we should take counsel together and where the present regulations do not suffice, amend them, drastically if need be; but don't destroy them and adopt some plan wholly new and untried in this country. Excepting those who have their personal advantages to gain, whether consciously or unconsciously, or theories which they want to reduce to practice, very few want it. It does not have the support of the practical men of to-day.

New Legislation

It may be of interest to say a word on the subject of proposed changes in the law. On January 21, 1919, Congressman Esch in the House, and I in the Senate, introduced a bill to make certain changes in the "Act to Regulate Commerce." The principal changes are:

First. To extend its regulations to any common carrier or carriers engaged in the transportation of passengers or property, not only wholly by railroad, but also to those engaged in such transportation "wholly by boat between points on the rivers and lakes of the United States, and in such carriage of persons and property, partly by railroad and partly by water, whether or not both are used under a common control, management, or arrangement for a continuous carriage or shipment."

Second. That hereafter, in reaching its conclusions as to the reasonableness of any rate, fare, charge, classification, regulation or practice, the commission shall take into consideration the increased cost of labor and other operating costs, in so far as they become material, in any case under investigation.

Third. The commission is authorized and directed to require carriers to interchange and use all engines, cars, and other facilities owned or used by them in such manner as shall best serve the public interest in times of shortage of equipment in any section of the country, upon just and reasonable terms as between the carriers as the commission may prescribe; and the commission is authorized and directed, to provide by order for the use, in the public interest, of all terminals of carriers, upon such terms as between the carriers as the commission may find just and reasonable.

Fourth. The Commission is authorized, from time to time, upon application by carriers, or others, or upon its own initiative without such application, to permit, upon order, the pooling of traffic and facilities and the consolidation of two or more carriers, under such rules and regulations and under such terms as shall be just and reasonable, as in its opinion shall conduce to the public good; which arrangements shall continue so long as in the judgment of the commission the public interest may require.

Fifth. The Commission is authorized not only to fix the maximum rate as heretofore, but in case it finds such action just and reasonable, prescribe the minimum rate, fare or charge to be published and maintained by the carriers.

Sixth. Provision is made for doing away with the so-called twilight zone which exists between the federal and state authorities, and with a view to the preservation for the public welfare of the functions and efficiency of both federal and state commissions.

Seventh. The issuance of all securities by a common carrier is subject to control and regulation by the Interstate Commerce Commission, and is very carefully guarded.

There is nothing in the Commerce Act fixing the standard of return on the capital invested. Assuming that the standard of return is fixed at 6 per cent, one plan proposed may be outlined in brief as follows: Let the country be divided into regions, fixing the traffic rates sufficiently high so as to yield a net return in each

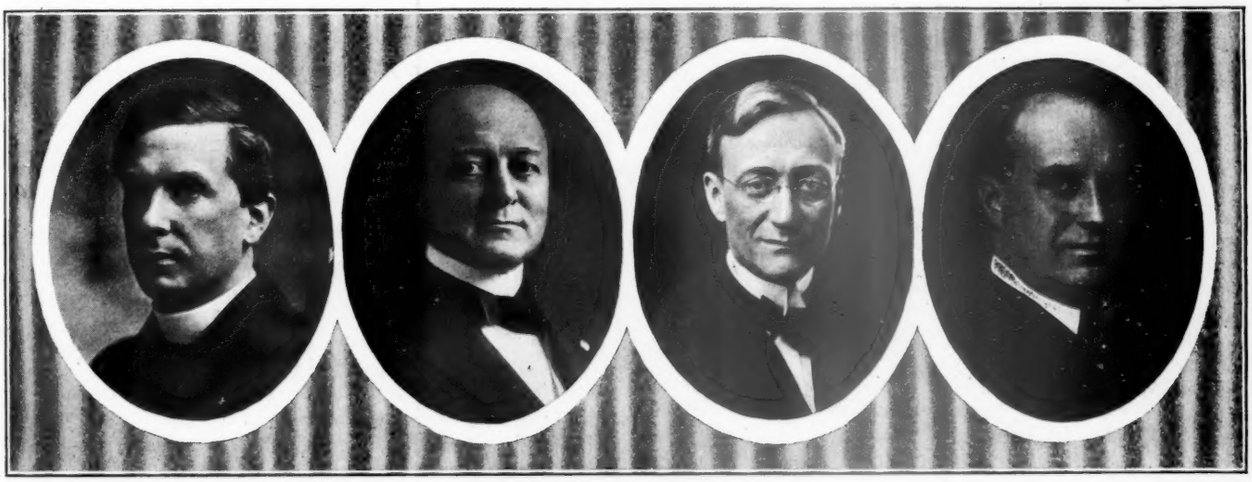
region of 6 per cent on the combined railroad property in that region. This, of course, would not be sufficient to yield 6 per cent on the new or poorly located or equipped roads, and it would yield more than 6 per cent on the better class roads. It is proposed that the surplus thus earned, over and above the 6 per cent on the total property investment, shall be applied in the public interest as follows:

(1) One-third for the benefit of the employes of the railroads.

(2) One-third to be retained by the railroad companies for such uses as they may determine.

(3) One-third to be held in a fund to be devoted to the purposes provided under the plan and under the direction of the Interstate Commerce Commission, or some other public agency.

I do not commit myself to the details of this suggestion, but I believe that out of it Congress can devise a plan which will at the same time prevent excessive earnings by some of the more prosperous roads, encourage by increased rates of fare some of the weaker roads, and fix a standard of return on the property invested which will induce new capital to embark in railroad enterprises.



Speakers at the A. R. E. A. Dinner

Rev. Geo. Adam | Sen. Atlee Pomerene | Judge Clarence N. Goodwin | Robt. J. Cary

Conclusions

Let me conclude by saying—

(1) I am unalterably opposed to any extension of government control.

(2) Government control was intended for war purposes, and it ought not to be continued for peace purposes, unless some assured, not speculative or conjectural, advantage can be gained thereby.

(3) I deny the legal or the moral right of any man, or set of men, to ask that the government hold private property during peace for a period of five years in order to attempt experiments in management.

(4) If government ownership is desired, a spirit of fairness and of common honesty would seem to suggest that the property be returned to its owners, and the issue made thereafter. In any event, the change from private ownership and operation under proper restrictions, or government ownership and operation, should be undertaken, if at all, in normal times, and not during this period of social, financial, and industrial unrest.

(5) Corrective legislation along the lines discussed tonight should be attempted first, rather than to adopt any revolutionary policy during this crisis in our country's affairs.

Noblesse Oblige, Our New Nationalism

Robert J. Cary, in speaking on the above subject, said in part:

Ex-President Taft, in discussing the League of Nations, says that we are to create 20 nations where there were but 4. All of these people, in whom sense of self-reliance, initiative and decision has been stifled by generations of repression, will greet liberty with wild eyes and fly apart as do molecules of gas when relieved of pressure. Imagine our trade relations, our economic intercourse with such an undisciplined force; imagine regulating immigration among masses of such humanity; imagine a plague of such vast dimensions, unquarantined; imagine the menace to the world's society, and particularly to our own institutions, in the unguided activities of so large a portion of the world's population.

Can the issue then, be, as the short-sighted would have us believe, between an altruistic League of Nations, in which we surrender our sovereignty for the universal brotherhood of man, on the one hand, and this country in splendid isolation wrapped in its own nationality for the purpose of saving and developing its material prosperity, on the other hand? I, for one, protest against the position in which the advocates of a League of Nations are permitting themselves to be unwittingly maneuvered. The primary issue is not now a question of avoiding entangling alliances, of refusing to embark on a voyage of idealism, but rather the highly expedient one of concluding a half-finished job to keep intact that for which we primarily entered the war, our own free institutions and our own prosperity.

We, of this generation, have been awkward patriots; for patriotism has always come to us with the impersonal touch; at best it has been recognized as a worthy abstraction taking concrete form in the romance of past achievement. But the material mobilization of this country, as the result of the war, tells only half of our recent story. The dynamic force of our progress in Europe, and by reflex in our own affairs, is found in the unlooked for spiritual mobilization of one hundred millions of people. The government, whether rightly or wrongly, is disintegrating the army, the air forces, the material resources of the war. Shall we also abandon, as no longer required in our national affairs, this greatest safeguard of liberty,

the present keen patriotism of the millions of the United States?

The Archbishop of York has told of hard gray days in England, of few doors that had not been visited by the Angel of Death, of men going to and fro with set faces and dry eyes, of thousands without resiliency, and then of the tremendous reaction sweeping through England, not alone because America had entered the war, but from the tremendous moral force of a united America entering the war. This land he pictured with its hundreds of millions in future generations as the chief world force to perpetuate human liberty, not by the old process of empire building, but by the reaction of its institutions throughout all other lands.

Our controversy is not whether we shall take our place in an international council. This is already predetermined by circumstance. Our insistence should be that criticism of the constitution of such a council shall be constructive, as coming from men eager to co-operate, but disputing only over ways and means of proper co-operation. This world's forces are put in play by unanimity of sentiment, not unanimity of opinion. Absence of controversy suggests the dead hand, but unanimity of sentiment is the moral force that has won the war. Millions, in response to this force, have already eagerly kept "Their Rendezvous with Death." It remains for us, the living, to finish the work.

"Language and Ideals"

Another speaker was Dr. George Adam, pastor of the Emannuel Congregational Church of Montreal, Que., whose subject was "Language and Ideals." Dr. Adam's theme was the bond of language between the peoples of America and Great Britain. He paid a glowing tribute to the language which, he said, derived its worth from the best of other tongues. It took poetic feeling from the Greeks, law from Latins and democracy from the Angles. Much has been added to the language in forceful and direct speech by the Americans. Dr. Adam touched also on the bond of friendly relations brought about by the participation of these two nations in the great war, with its sacrifices for common ideals of democracy and regard for the rights of smaller nations.

Revision of Capital Expenditures

(From Our Washington Editor)

IN VIEW of the financial situation imposed upon the Railroad Administration and the railroads by the failure of the $750,000,000 appropriation bill, the entire program of capital expenditures for this year is to be reviewed. The Division of Capital Expenditures has given the railroad corporate officers an opportunity to reconsider under existing conditions any approvals which have heretofore been given by them for additions and betterments, whether carried over from last year or new work.

T. C. Powell, director of the Division of Capital Expenditures, after conference with Howard Elliott, acting chairman of the Railway Executives Committee, has issued D. C. E. Circular No. 20 directing the regional directors to instruct each federal manager to afford the proper corporate officer, upon application, full opportunity to review all projects chargeable to the capital account whether in progress or contemplated. If the corporate officer withdraws or withholds approval of any project for financial reasons or otherwise, the instructions are as follows:

"1—Work not started shall not be commenced without further approval by this division.

"2—As to projects already started and actually under way, please see that no further work is done except, (a) when necessary to insure safety; (b) where the project is so far complete that to stop work would be more expensive than to continue it; (c) where the job is covered by bona fide contract and to stop the work would seriously demoralize conditions, especially as to the working forces.

"In all cases where the federal manager and the regional director believe the work should be done, whether as to new work or as to continuing work now in progress, even though the railroad company withholds or withdraws this approval, a full report should be promptly made to the Division of Capital Expenditures with a copy to the president of the company stating the objections or disagreements that cannot be overcome, with the definite recommendation of the federal manager and regional director. Pending further approval by this division no such work should be started and except as provided in Section 2 above no such work in progress should be carried on."

A. R. E. A. Men as Corporate Executives

ONE OF THE INTERESTING developments of the past year has been the induction of railway engineers, many of them members of the American Railway Engineering Association, into the corporate organizations of the roads, not alone as engineering officers, but as executives, namely, presidents, vice-presidents and chairmen. The creation of separate federal and corporate organizations on the roads, together with the selection of many presidents and vice-presidents of the various railroads for government positions as federal managers or as officers of the central or regional organizations of the Railroad Administration created many vacancies in the corporate organizations of the roads, and several members of the American Railway Engineering Association were named to fill such vacancies. Among these may be mentioned A. S. Baldwin, vice-president of the Illinois Central; L. C. Fritch, vice-president of the Chicago, Rock Island & Pacific, and Charles S. Churchill, vice-president of the Norfolk & Western; all three of them are past presidents of the A. R. E. A. Others on the list are E. H. Lee, president of the Chicago & Western Indiana; W. H. Finley, president of the Chicago & North Western, and Ralph Budd, chairman of the Executive committee, Chicago, Burlington & Quincy. While it may not have been entirely clear at the time that the separation of the corporate from the government managements of the railroads took place, subsequent events have clearly demonstrated the distinct need of strong corporate organizations to protect the interests of the properties and their owners.

In attempting to analyze the reasons for some of the earlier appointments of railway engineers to corporate executive positions, it was seen that there was a special need for engineering rather than operating talent in fulfilling these important stewardships because of the necessity for a check on the character of additions and betterments undertaken by the government as well as for a study of the degree to which the roads are being maintained according to the standards prevailing previous to the advent of government operation. The fact that valuation work was being continued was cited as a further reason for the need of officers in the corporate organizations who were thoroughly conversant with this problem. But as pointed out recently by one corporate officer, such engineering ability could very readily have been retained in the corporate organizations without need of appointments to executive positions. More than this, exactly the same qualifications for executive officers are demanded today as were required of men in like positions under

private managements of the roads. As a matter of fact, the only bearing which the present state of separate government and corporate organizations has on the matter is the fact that this separation created a large number of vacancies at one time.

A number of the men mentioned above were occupying executive or operating positions at the time that they were placed in the corporate organizations. Mr. Lee had been vice-president and chief engineer of the Chicago & Western Indiana; Mr. Budd, those training had been largely in engineering, was executive vice-president of the Great Northern, and Mr. Fritch, who was formerly chief engineer of the Chicago Great Western, had more recently occupied operating positions on the Canadian Northern and the Seaboard Air Line. On the other hand, Mr. Finley, who had been chief engineer and for a long time bridge engineer, of the Chicago & North Western; Mr. Baldwin, who was chief engineer of the Illinois Central, and Mr. Churchill, formerly chief engineer and recently assistant to the president in charge of valuation on the Norfolk & Western, were occupying engineering rather than executive positions at the time of their advancement, although the fact that they were called into a broader field is positive proof that their duties as engineers had been demanding activities not limited to a narrow interpretation of the term "engineering." Appointments like those above mentioned testify to the ability of the engineers to develop along the broad lines and for the high standards set by the American Railway Engineering Association for its members and officers.

A. R. E. A. Registration

Following is the registration of the members and guests at the convention of the American Railway Engineering Association on Wednesday:

Members

Allen, Andrews, Consulting Engineer, Chicago.
Allee, O. P., Prest., Railway Concrete Supply Co., Kansas City, Kan.
Andrews, Geo. W., Asst. to Eng., M. W., B. & O. R. R., Baltimore, Md.
Andrews, J. T., Asst. Eng., B. & O. R. R., Baltimore, Md.
Barnhart, E. H., Asst. Eng., B. & O. R. R., Baltimore, Md.
Blanchard, A. M., Val. Dept., Grand Trunk Ry., Montreal, Can.
Bloecher, Theo., Jr., Div. Eng., B. & O. R. R., Philadelphia, Pa.
Boardman, H. E., Asst. Eng., Val. Dept., N. Y. C. Lines, New York, N. Y.
Bohland, J. A., Bridge Eng., G. N. Ry., St. Paul, Minn.
Boots, E. W., Asst. Eng., P. & L. E. R. R., Pittsburgh, Pa.
Bowser, E. H., Supt., Timber Dept., I. C. R. R., Memphis, Tenn.
Brown, J. M., Corp. Eng. Maintenance and Construction, C. R. I. & P. Ry. Co., Chicago, Ill.
Browne, H. L., Asst. Eng., C. B. & Q. R. R., Galesburg, Ill.
Buck, C. M., Div. Eng., A. T. & S. F. Ry., Topeka, Kan.
Butterworth, A. S., Chief Eng., G. F. & A. Ry., Pensacola, Fla.
Cassil, H. A., Eng. M. of Way, P. M. R. R., Detroit, Mich.
Clapper, Leland, Eng. B. & B., D. & I. R. R. R., Two Harbors, Minn.
Clarke, A. C., Asst. to Chief Eng., B. & O. R. R., Baltimore, Md.
Clift, A. E., Gen. Mgr., I. C. R. R., Chicago, Ill.
Connor, E. H., C. E., Mo. V. Br. & I. Co., Leavenworth, Kan.
Cook, R. A., Val. Eng., C. & A. R. R., Chicago, Ill.
Copland, A. C., Office Eng., C. & O. Ry., Richmond, Va.
Cronican, W. P., Asst. Eng., Illinois Cent. R. R., Chicago.
Cunningham, A. O., Chief Eng., Wabash Ry., St. Louis, Mo.
Darrow, F. T., Asst. Chef Eng., C. B. & Q. R. R., Lincoln, Neb.
Delo, C. G., Chief Eng., C. G. W. R. R., Chicago, Ill.
Dewey, S. J., Asst. Sig. Eng., Big Four Ry., Cincinnati, O.
Dixon, J. M., St. Paul, Minn.
Doyle, T. L., Asst. Div. Eng., Pa. Lines, Logansport, Ind.
Edmondson, G. N., Div. Eng., N. Y. C. R. R., Rochester, N. Y.
Fisher, W. A., New York, N. Y.
Flora, G., Insp. Track Val., Grand Trunk Ry., Durand, Mich.
Goodell, John S., Asst. Eng., Santa Fe Ry., Hollyrood, Kan.
Gowdy, R. C., Chief Eng. for Corp., C. & S. Ry. Co., Denver, Colo.
Fritch, L. C. (Past-President), V. P. and Corp. Eng., C. R. I. & P. Ry. Co. and Minneapolis & St. Louis R. R. Co., Chicago.
Grant, E. W., Asst. Eng. Val., Santa Fe Ry., Topeka, Kan.
Gwyn, J. G., Chief Eng., D. & R. G. R. R., Denver, Colo.
Hadley, E. A., Engr. Asst. to Reg. Dir., U. S. R. A., St. Louis, Mo.
Haggander, G. A., Bridge Eng., C. B. & Q. R. R., Chicago, Ill.
Hamilton, H. F., Res. Eng., G. N. Ry., St. Paul, Minn.
Harris, L. G., Div. Eng., A. T. & S. F. Ry., San Marcial, N. M.
Harrison, E. A., Architect, A. T. & S. F. Ry., Chicago, Ill.
Hartley, L. C., Chief Eng., C. & E. I. R. R., Chicago, Ill.
Heidenthal, W. C., Eng. M. W., N. Y. O. & W. Ry., Middletown, N. Y.
Hewes, John, Jr., Div. Eng., B. & O. R. R., Flora, Ill.
Hogeland, A. H., Chief Eng., Great Nor. Ry., St. Paul, Minn.
Hunley, John B., Eng. Bridges and Str., Big Four Ry., Cincinnati, O.
Huntley, R. L., Chief Eng., U. P. R. R., Omaha, Neb.
Hynes, M. V., Gen. Supt., C. I. & W. R. R., Indianapolis, Ind.
Jacoby, H. S., Cleveland, Ohio.
Johns, C. W., Eng., Branch Lines, C. & O. Ry., Richmond, Va.
Johnson, Noah, Val. Eng., Wabash R. R., St. Louis, Mo.
Johnston, D. B., Div. Eng., Pa. Lines, Louisville, Ky.
Johntz, H. H., Div. Eng., M. K. & T. Ry., Parsons, Kan.
Khuen, Richard, Gen. Man. Erect., Am. Bridge Co., Pittsburgh, Pa.
Kissell, J. E., Eng. M. of Way, Big Four Ry., Mt. Carmel, Ill.
Kittredge, George W. (Past-President), Chief Eng., N. Y. C. R. R., New York City.
Lane, H. A., Chief Eng., B. & O. R. R., Baltimore, Md.
Larsen, Albert, Div. Eng., Miami Con. Dist., Dayton, Ohio.
Layng, F. R., Eng. Track, B. & L. E. R. R., Greenville, Pa.
Leisenring, J. G. M., Sig. Eng., Ill. Trac. Sys., Springfield, Ill.
Lonnbladh, L. F., Special Eng., Brier Hill Steel Co., Youngstown, Ohio.
Manson, E. F., Master Carpenter, Rock Island Lines, Manly, Ia.
Markley, A. S., Master Carpenter, C. & E. I. R. R., Danville, Ill.
McKey, D. M., Loc. Eng., S. A. L., Plant City, Fla.
Merwin, C. E., Chief Eng., Detroit Ter. Ry., Detroit, Mich.
Milburn, J. H., Chief Draftsman, B. & O. R. R., Baltimore, Md.
Morrow, F. E., Chief Eng., C. & W. I. R. R., Chicago, Ill.
Murray, W. A., Div. Eng., N. Y. C. R. R., Albany, N. Y.
Myers, J. B., Eng. M. of W., B. & O. R. R., Eastern Lines, Baltimore, Md.
Nuelle, J. H., Gen. Man., N. Y. O. & W. Ry., Middletown, N. Y.
Nye, C. M., Prin. Asst. Eng., G. N. Rv., St. Paul, Minn.
Olson, E. H., Asst. Eng., A. T. & S. F. Ry., Chicago, Ill.
Patterson, J. C., Prin. Asst. Eng., Erie R. R., New York.
Paul, C. E., Prof. of Mech., Armour Inst. of Tech., Chicago, Ill.
Pedersen, H., Asst. Eng., M. St. P. & S. S. M. Ry., Minneapolis, Minn.
Peterson, W. H., Eng. M. W., C. R. I. & P. Ry., Des Moines, Iowa.
Pittman, T. M., Jr., Asst. Eng., Ill. Cent. R. R., McComb, Miss.
Puder, F. R., Asst. Eng., C. T. H. & S. E. Ry., Chicago, Ill.
Raymond, W. G., Dean. Colo. Appl. Sc., State Univ. Iowa, Iowa City, Iowa.
Reid, J. W., Str. Eng., Robins Conveying Belt Co., Chicago.
Rex, George E., Mgr., Treating Plants, Santa Fe Sys., Topeka, Kan.
Ringer, Frank, Vice-Pres., Joplin Union Depot Co., Dallas, Tex.
Roach, J. H., Val. Eng., N. Y. C. R. R., New York City.
Robinson, J. S., Div. Eng., C. & N. W. Ry., Chicago, Ill.
Rose, L. S., Asst. to Fed. Man., Big Four Ry., Cincinnati, O.
Schmid, R. L., Asst. Eng., N. C. & St. L. Ry., Nashville, Tenn.
Schnacke, A. D., Asst. Eng., A. T. & S. F. Ry., Topeka, Kan.
Scribner, C. J., Asst. Scale Eng., C. B. & Q. R. R., Chicago.
Sessions, O. H., Asst. Eng., G. T. Ry., Battle Creek, Mich.
Shaw, W. J., Jr., Div. Eng., M. C. R. R., St. Thomas, Ont.
Shillinger, J. G., Chief Eng., Rutland R. R., Rutland, Vt.
Simmons, I. L., Bridge Eng., C. R. I. & P. Ry., Chicago, Ill.
Skeels, E. B., 875 Old Colony Bldg., Chicago.
Smith, Lowry, Special Engr., Nor. Pac. Ry., Brainerd, Minn.
Soete, F. X., Val. Eng., N. Y. O. & W. Ry., Middletown, N. Y.
Sperry, H. M., New York.
Stimson, F. J., Supt., Pa. Lines, Richmond, Ind.
Storey, W. B. (Past-President), Federal Mgr., A. T. & S. F. Ry. System, Chicago, Ill.
Strayer, L. W., Div. Eng., B. & O. R. R., New Castle, Pa.
Teal, J. E., Asst. Eng., B. & O. R. R., Baltimore, Md.
Tuthill, G. C., Acting Br. Eng., M. C. R. R., Detroit, Mich.

Van Hagan, L. F., Asso. Prof., U. of Wis., Madison, Wis.
Walker, W. K. (in military service).
Walling, V. R., Prin. Asst. Eng., C. & W. I. R. R., Chicago, Ill.
Waterman, J. H., Supt. Timber Pres., C. B. & Q. R. R., Galesburg, Ill.
Westfall, C. C., Eng. Bridges, I. C. R. R., Chicago, Ill.
Wiggins, W. D., Val. Eng., Pa. Lines West, Pittsburgh, Pa.
Williams, H. C., Chief Eng. Con., L. & N. R. R., Louisville, Ky.
Williams, K. G., Res. Eng., Union Ry. Co., Memphis, Tenn.
Williams, S. N., Professor-Emeritus of Civ. Eng. (Cornell College, Iowa), Oak Park, Ill.
Wilson, C. A., Consulting Engineer, Cincinnati, Ohio.
Wurzer, E. C., Div. Eng., M. C. R. R., Detroit, Mich.
Zinn, A. S., care Chief Eng. Office, M. P. R. R. Co., St. Louis, Mo.
Zook, M. A., Res. Eng., Bureau of Valuation, I. C. C., Washington, D. C.

Guests

Anderson, Burt T., Asst. Sig. Eng., D. L. & W. R. R., Hoboken, N. J.
Artmann, H. L., Asst. Engr., S. A. R. R. R ., Atlanta, Ga.
Atwill, A. L., Asst. Engr., C. & W. I. R. R., Chicago.
Ayars, E. J., Div. Eng., Pa. R. R., Williamsport, Pa.
Barber, H. E., Gen. Mgr., M. & E. R. R., Marion, Ill.
Beauwheel, A., Roadmaster, Ottawa, Ontario.
Bibbs, J. E., Asst. Bridge Engr., M. C. R. R.
Bretschneider, Wm,, Div. Engr. Dt. E. & W. T. Ry., Houston, Tex.
Brooks, J. T., Roadmaster, Maine Central R. R., Brunswick, Me.
Busch, H. F., Springfield, Mo.
Cartwright, H. B., Asst. Engr., S. A. L. R. R., Jacksonville, Fla.
Chevery, E A., Supt. Mo. Pac.
Clark, A. M., Asst. Br. Engr., N. Y. C. & St. L., Cleveland, O.
Cook, Oscar U., Metallurgical Engr., Tenn. Coal, Iron & R. R. Co., Birmingham, Ala.
Correll, H. E., Supt. C. R. I. & P., Eldon, Mo.
Cowell, H. E., Supt., C. R. I. & P., Eldon, Mo.
Dwyer, Edw. J., Supvr. Track, Erie R. R., Croxton, N. J.
Eddington, C. R., Galesburg, Ill.
Fithian, E. B., Mo. Pac., Poplar Bluff, Mo.
Hall, W. H., Supt. Tel., M. K. & T. R. R.
Harting, O. F., Asst. Ch. Eng., T. R. R. A. of St. L., St. Louis, Mo.
Hesselbusch, H. W., Asst. C. E., Southern R. R., Washington, D. C.
Horton, W. D., Patton Paint, Chicago.
Howe, Woodbury, Locating Eng., A. T. & S. F. Ry., Chicago.
Judd, Frank R., Engr. of Bldgs., I. C. R. R., Chicago, Ill.
Keig, J. R., Chief Frt. Insptr., Central Region, Purchasing Comm., U. S. R. R. R. A.
King, Coleman, Long Island R. R., Jamaica, N. Y.
LaRoy, H. A., Div. Engr., Portland Cement Assn.
Malloy, G. J., Asst. Div. Engr., Erie R. R., Jersey City, N. J.
Malone, J. F., Insptr. M. of W., Cincinnati, O.
Meriwether, David, Jr., Asst. to Ch. Eng. Const., Southern R. R., Washington, D. C.
Miner, K. S., Superv. B. & B., N. Y. C. R. R., Ottawa, Ontario.
Ratliff, C. M., Asst. Engr., K. & I., Louisville, Ky.
Shermerhorn, A. D., Div. Engr., U. P. R. R., Omaha, Neb.
Van Antwerp, Eugene, G. T. Ry., Detroit, Mich.
Selden, M. C., Asst. Supt., C. & O. R. R., Newport News, Va.
Smith, R. M., Asst. Engr., Mo. Pac. R. R., Falls City, Neb.
Snyder, J. A., Roadmaster, M. C. R. R., Jackson, Mich.
Stewart, Frank J., Supvr. Track, Erie, Podjervis, N. J.
Vielland, L. F., Jamaica, N. J.
Wagner, W. H., Elec. Eng., Bur. of Standards, Washington, D. C.
Walker, John, Asst. Eng., G. T. Ry., Alandale, Ontario.

Railroad Administration Collects Maintenance Data

For the purpose of affording a comparison of the expenditures for maintenance of way and structures to measure the amount of upkeep during the period of federal control and during the three-year test period, as well as to set the program of maintenance for 1919, the Division of Operation of the Railroad Administration has issued Circular No. 28, accompanied by five blank forms calling for information as to each property under federal control regarding the expenditures in the years ended June 30, 1915, 1916 and 1917 and December 31, 1918. The contracts between the government and the railroad companies specify that such an analysis of the maintenance of way and structures expenses may be made at the end of each year of federal control. It is also considered necessary to call for this data in order to set the program of maintenance which will be required during the current year. An explanation of the forms and instructions for furnishing the information, which is to be forwarded by May 1 to C. A. Morse, assistant director of the Division of Operation, is given in the circular as follows:

Explanation of Forms to Be Used in the Analysis of Yearly Expenses

Form EM2—Analysis of Total Maintenance of Way and Structures Expenses

This form is designed to show an analysis of total maintenance of way and structures expenses for the purpose of comparison between the test period and the federal control period. A report upon this form should be rendered for each year of both the test and federal control periods, by accounts and for each operating division as well as for the total operating property. Where the expenses are kept by accounting divisions instead of operating divisions, the expenditures of the accounting divisions embracing the operating division shall be combined. No separation of the expenses of an accounting division shall be made where it is included in two or more operating divisions, but it shall be included as a whole in the operating divisions in which it has the greatest mileage. For the railroads having accounting divisions a sketch map should be furnished showing the relation of the accounting divisions as combined to the actual operating divisions, together with the mileage of the operating divisions as combined from the accounting divisions, for each year under consideration.

Column 1—*Accounting Number.* This is self-explanatory.

Column 2—*Maintenance of Way and Structures Expenses—Primary Accounts.* Contains the maintenance of way and structures accounts classified under groups. This classification is for the purpose of equating expenses in the test period to correspond to the basis of cost of labor and material during the federal control period. The joint facility accounts have been omitted from this column for the purpose of showing for each railroad the gross amount expended by it for the maintenance of way and structures upon the property covered by its contract. The account "No. 275 Insurance" has also been omitted in accordance with section 5 (a) of the contract.

Column 3—*Total Maintenance of Way and Structures Expenses.* The items to be included in this column should correspond with the railroad's report to the Interstate Commerce Commission.

Column 4—*Labor (Including Contract Labor Force Account).* Under this head include the labor charges which are made directly from pay roll distributions and contractor's force account vouchers.

Column 5—*Net Material Charges.* Include under this head the amounts charged from material distributions and other sources, suitable deductions to be made to cover credits on account of material recovered, including scrap material.

Column 6—*Ledger Value of Property Retired and Replaced.* Include in this column charges to maintenance of way and structures expenses, representing the ledger value of property retired and replaced, as defined in Para-

graph 7 of General Instructions, page 13, Road and Equipment Classification.

Column 7—*Charges for Property Retired and Not Replaced.* Include in this column any charges which have been made to maintenance of way and structures expenses representing the value of property retired and not replaced.

Column 8—*Depreciation.* Include in this column any charges which may have been made to the depreciation accounts in the Interstate Commerce Commission Classification of Operating Expenses, where same has been kept by any road.

Column 9—*Miscellaneous Charges and Credits.* Include in this column all miscellaneous charges or credits, such as work train expenses (including labor and material when not directly distributed to primary accounts from pay roll and material distributions), miscellaneous vouchers, lump sum contracts, bill credits, etc.

Form EM3—*Comparison of Labor Costs for the Test Period with the Federal Control Period.* This form is for the purpose of obtaining the factors for equating the amount of labor (including contract labor) for the test period upon the basis of labor costs for the federal control period. It will be prepared by operating divisions and total operating property.

Column 1—*Group.* Contains the groups under which the accounts are classified, as published in Column 2 of Form EM-2. Only groups which include labor charges are here shown.

Column 2—*Occupation.* Show the principal occupations of employees engaged in work classifiable under the respective groups. Opposite the designation "Others" give information for all occupations not specifically named in the form, it only being essential that opposite this caption there shall be included items for labor which are relatively large and will materially affect the general averages.

Column 3—*I. C. C. Classification of Employees—Numbers.* The number shown in this column corresponds to schedule 561, "Employees and their compensation" as reported to the Interstate Commerce Commission. There the items are prefixed with the word "All," both the units and compensation as reported to the commission should be taken. The items prefixed with the word "Part" should be distributed so as to include under each group only the units of service and compensation properly assignable.

Column 4—*Units of Service.* In this column the units of service should be given in hours. The service of monthly employees should be reduced to hours upon the basis of the assigned number of hours constituting a year's work.

Column 5—*Compensation.* In this column should be shown the compensation properly assignable to the units included in Column 4.

Note.—There should be included in Columns 4 and 5, the units of service and compensation for labor covered in vouchers when the amount of such labor is sufficiently large to materially affect the "Equation Factor" of any group.

Column 6—*Average Compensation Per Unit of Service.* Under this head show the quotient obtained by dividing items in Column 5 by those in Column 4.

Note.—In Columns 7, 8 and 9 show for the federal control period information similar to that required in Columns 4, 5 and 6 for the test period.

Note.—Columns 6, 9 and 10 require no entry except on the lines designated "Totals and Averages."

Column 10—*Equation Factor.* Show under this head the quotient obtained by dividing Column 9 by Column 6.

Form EM-4—*Comparative Cost of Principal Items of Maintenance of Way and Structures Materials.* This form is designated for the purpose of obtaining the factors for equating the net material charges for the test period upon the basis of the cost of material during the federal control period. To be prepared only for total operating property.

Column 1—*Description of Material.* In this column should be listed, under the groups, the more important items of material properly assigned. A list of such material is at end of these instructions. Important items not included in the list are to be considered by individual railroads. In this column is also shown "Equation factor." Information for this item is only to be shown in Column 10. Group (3) "Rails," should be sub-divided (a) New Rails, (b) Second-hand Rails, (c) Scrap Rails.

Column 2—*Unit of Measure.* In this column should be included the appropriate units for the several classes of material shown.

Column 3—*Quantities Used for Three Years.* This column is provided to show the total quantities of the several classes of material used in maintenance during the test period.

Column 4—*Total Cost for Three Years.* Show the total costs of material used, the quantities of which are shown in Column 3.

Column 5—*Average Quantity Per Year.* The total quantity of each item of material should be shown in this column. These quantities are obtained by dividing quantities in Column 3 by three (years).

Column 6—*Average Total Cost Per Year.* The information in this column is obtained by dividing the information in Column 4 by three (years).

Column 7—*Quantities Used Year 1918.* The total quantity of each item of material used during the year 1918 should be shown in this column. For the purpose of this return the quantity of each class of material charged to accounts, "Ties," "Rails" and "Ballast," should be shown. With respect to other accounts it is intended that only the quantities of the important items of material should be shown. A general description of these items is given at the end of these instructions.

Column 8—*Total Cost Year 1918.* Show the total cost of material the quantities of which are shown in Column 7.

Column 9—*Average Unit Prices.* In this column should be shown the average unit prices at which the material of the several classes used for maintenance was charged in the accounts for the year. Where but one grade or kind of material is included in an item, the average disbursement price should be shown. Where an item includes several different grades or kinds of material divide the total charges for the material issued during the year by the number of units.

Column 10—*Cost Based on Average Quantities for Test Period.* The information required is obtained by multiplying the quantity shown in Column 5 by the prices shown in Column 9. In addition to the cost there is also to be shown in this column the equation factor. This factor is obtained by dividing the total for the group under Column 10 by a similar total in Column 6.

Form EM-5—*Comparison of Maintenance of Way and Structures Expenses (2 Sheets).* This form is designed to show by accounts the labor, material and miscellaneous charges (Columns 4, 5 and 8, Form EM-2) for the test period (average), the year of federal control, the equated expenses for the test period and the increase or decrease in expenses in federal control period, compared with equated expenses for test period. This form is to be prepared by operating divisions and total operating property.

Sheet 1—Column 1—*Account Numbers.*

Column 2—*Maintenance of Way and Structures Expenses—Primary Accounts.* The accounts shown in this

column are the same as on Form EM-2, with the exception that on Sheet 1, Account 214, Rails, is sub-divided to show separately new, second-hand and scrap rails. This separation is made for the purpose of more accurately equating the expenses for rails used in maintenance during the test period to the basis cost of such material for the federal control period. This separation is not considered necessary on Sheet 2.

Column 3—*Average Expenses for Test Period—Labor.* The labor expenses shown in Column 4, Form EM-2, for each year of test period is to be totaled and divided by three to arrive at the average for test period.

Column 4—*Equation Factors.* The equation factors shown in Column 10, Form EM-3, are those to be shown in Column 4, the factor for the group being inserted opposite the various accounts of the group. As group 10 has no equation factor or Form EM-3 the factor for this group is obtained after the equated expenses for groups 1 to 9 have been totaled in column 9, sheet 2. The sum total of groups 1 to 9, column 9, sheet 2, should be divided by the sum total of these same groups for the "average of test period," column 8, sheet 2, which gives you the equation factor for group 10.

Column 5—*Equated Expenses—Test Period.* This information is obtained by multiplying column 3 by column 4.

Column 6—*Federal Control Expenses.* This information is taken from column 4, Form EM-2, for the year of federal control.

Column 7—*Increase or Decrease in Federal Control Expenses.* This information is obtained by deducting column 5 from column 6. Increases to be shown in red, decrease in black.

Columns 8 to 12—*Material Expenses.* The information for these columns is prepared from the same sources as columns 3 to 7. The equation factors, column 9, however, is taken from column 10, Form EM-4, except for group 10. These factors, while for total operating property, will be applied the same for each operating division.

Sheet 2—Column 2—*Maintenance of Way and Structures Expenses—Primary Accounts.* The accounts shown in this column are the same as on Form EM-2. At the bottom of this column, after the sum total is shown for groups 1 to 10, items are provided for the totals of columns 6, 7 and 8, Form EM-2, showing "Ledger Value of Property Retired and Replaced," "Charges for Property Retired and Not Replaced" and "Depreciation." The information for these three items are only to be shown in the total columns 8 to 11, as they are not subject to equation. In columns 8 and 9 show the same amounts, being the "average for test period."

Columns 3 to 7—*Miscellaneous Charges and Credits.* The information for these columns is obtained from same sources as columns 3 to 7 in sheet 1. The equation factors, however, are composite and obtained from the labor and material results on sheet 1 as follows: Divide the sum of columns 5 and 10 (sheet 1) by the sum of columns 3 and 8 (sheet 1) for each group except group 10.

Columns 8 to 11—*Totals—Labor, Material and Miscellaneous.* These columns are the totals of the preceding columns, namely, 3, 5, 6, 7, 8, 10, 11, 12 (sheet 1) and 3, 5, 6 and 7 (sheet 2).

Form EM-6—*Extraordinary Items of Maintenance of Way and Structures Expenses.* It is the object of this form to segregate each year those items of an extraordinary nature which impair a true analysis of the maintenance expenses of the property for the purpose of measuring the standard of upkeep. From an operating and engineering standpoint we are concerned with the fair distribution of the expenditures over the property and the return of the property in good repair and for that reason we separate in this analysis the expenditures by divisions and try and arrive at those expenditures which reflect the comparative maintenance of the property during the test period and period of federal control. For test period use equated expenses.

Column 1—*Account Numbers.*

Column 2—*Maintenance of Way and Structures Expenses—Primary Account.* The accounts in this column are the same as Form EM-2.

Column 3—*Maintenance Expenses Incidental to Additions and Betterment Work.* In all improvement work there are maintenance of way and structures expenses incidental thereto, such as demolishing the property, rearranging or relocating existing tracks and structures (including in some instances a charge of line), maintaining traffic during the work, etc. As these expenditures have no direct bearing on the ordinary upkeep of the property, it is necessary that we set them aside in this column. The estimate for authority for capital expenditure will show these items and in many cases the estimate can be used in arriving at these incidental expenses; but for large improvements these estimates are, of course, often materially changed in the actual work done and should be checked in such cases.

Column 4—*Extraordinary Maintenance of Way and Structures Expenses From Floods, Explosions, Train Wrecks and Accidents.* These expenses when extraordinary are readily obtainable; the ordinary expenditures should not be accounted for in this column.

Column 5—*Salvage Credits in Connection with Property Retired.* On Form EM-2, column 6, we show the "Ledger Value of Property Retired and Replaced," but the salvage credits are included in column 9. These credits where they are sufficiently large to affect the yearly expenditures should be stated in this column.

Columns 6 to 9—These columns are left blank for the convenience of the individual roads for use in setting forth any other expenses entering into the yearly expenditures which are extraordinary, such as large adjustments, large credits not previously separated in this analysis, etc. Fire losses during federal control should be shown on this blank by accounts if they enter to any degree into the expenses, and in any case should be stated in total for the year.

General—The foregoing forms should bring out a true indication of the upkeep of the property, but the reporting official should supplement them with any additional information of conditions of which he is familiar that may aid in arriving at the correct situation as to the maintenance of the railroad.

Extracts From Contract—Section 5—"Upkeep"

Section 5—(a) During the period of federal control the director general shall, annually, as nearly as practicable, expend and charge to railway operating expenses such sums for the maintenance and repair of the property as may be requisite in order that such property may be returned to the companies at the end of the federal control in substantially as good repair as it was on January 1, 1918: Provided, however, that the annual expenditure and charges for such purposes during the period of federal control on such property and the fair distribution thereof, over the same, equal an amount in the aggregate to the average annual expenditure during the test period, less the cost of fire insurance included therein, except so far as the amount expended is subject to the adjustments provided in paragraph (c) of this section relating to the difference in cost of labor and material and the provisions of paragraph (e) of this section in regard to the destruction of property by fire.

(b) The director general may expend such sums, if any, in addition to those expended under paragraph (a)

of this section, subject to adjustments paragraph (c) as may be requisite for the safe operation of the property assuming a similar use to the use during the test period, and not substantially enhancing the cost of maintenance over the normal standard of maintenance of railroads of like character and business during said period, and the amount of such excess expenditure during federal control shall be made good by the companies.

(c) In comparing the amounts expended under paragraphs (a) and (b) of this section with the amounts expended during the test period due allowance shall be made for any difference that may exist between the cost of labor and materials and between the amount of property taken over and the average for the test period, and as to paragraph (a) for any difference in use between that of test period and during federal control, which, in the opinion of the commission, is substantial enough to be considered, so that the results shall be, as nearly as practicable, the same relative amount, character and durability of physical reparation.

(d) At the request of the director general or the company, there shall be an accounting of the amounts due by or to any of the parties under paragraphs (a) and (b) of this section, at the end of each year of federal control and at the end of federal control.

(e) If during federal control any of the property is destroyed or damaged otherwise than by fire or public enemies, and is not restored or replaced by the director general, he shall reimburse the companies the value of the property destroyed or the amount of the damage at the time of the loss, and the cost of restoration or replacement, or said value or damage, as the case may be, shall be charged to annual railway operating expenses, it being understood that extraordinary losses caused by floods, explosions, train wrecks or accident are included in the matters covered by this paragraph, while ordinary losses due to such causes are included in the matters covered by paragraph (a) of this section.

If during federal control any of the property is destroyed or damaged by fire, and is not restored or replaced by the director general, he shall reimburse the companies the value of the property destroyed or the amount of the damage at the time of the fire; and the cost of restoration or replacement of said value or damage, as the case may be, shall be charged to annual railway operating expenses, but the same shall not be considered a charge to such expenses for the purposes specified in paragraph (a) of this section.

(f) If any addition, betterments or road extensions are made to the property taken over at the expense of the companies and with the approval or by the order of the director general during federal control, he shall expend and charge to railway operating expenses such sums for labor and materials as may be requisite for the proper maintenance and repair of such property until end of federal control.

The circular also quoted from section 5 of the standard form of compensation contract between the Railroad Administration and the railroad companies, which governs the matter up upkeep.

Because the preparation of the forms has required more time than was expected, Mr. Morse recently issued instructions in the form of a letter to regional directors for the preparation of the data required to make up a maintenance program for this year so that the average upkeep for 1918 and 1919 will be equal to that of the test period after equating for the increased prices for labor and materials, but the information required for that purpose is in much less detail than that called for by the circular and is to be submitted for approval by April 15.

A. R. E. A. Men Identified With Railroad Administration

THE LARGE MEASURE OF recognition given to the American Railway Engineering Association through the appointment of its officers and members to important positions in the central and regional organizations of the United States Railroad Administration is a striking evidence of the high standing of the association. While these appointments have been made on the individual merits of the men selected, it is no reflection on them to say that identification with the activities of the association exerted no small influence in their selection for these positions. Of particular significance from the standpoint of the association was the selection of its president, C. A. Morse, formerly chief engineer of the Chicago, Rock Island & Pacific, for the position of assistant director of the division of operation in charge of maintenance, with headquarters at Washington. In this same connection attention is also directed to the fact that H. R. Safford, second vice-president of the association, is also in the government service, having been called from Canada, where he was chief engineer of the Grand Trunk, to the position of engineering assistant to Hale Holden, director of the Central Western region.

Probably the most important position held by any member of this association is that of director of the Northwestern region, occupied by R. H. Aishton, formerly president of the Chicago & North Western, who is member No. 237 of the A. R. E. A. and one of the first members to be identified with the Railroad Administration, when, as regional director of the Western region, later divided into three regions, he was in direct charge of all railways in the Western section of the United States.

Railway engineers were first used in a strictly engineering capacity in connection with the organization of the Railroad Administration in passing upon the budgets presented by the individual railroads for additions and betterments, work to be done as war measures during the construction season of 1918. This work was conducted largely by E. E. Adams as assistant to the director of the division of capital expenditures. The director of this department was until recently Robert S. Lovett, president of the Union Pacific, under whose direction Mr. Adams had worked for several years as consulting engineer for the Union Pacific system. Approval of additions and betterments budgets in the Eastern region was for a considerable period subject to the review of an engineering committee of which F. L. Stuart, consulting engineer, and H. A. Lane, chief engineer, of the Baltimore & Ohio, were members.

Following the promulgation of wage order No. 27, a Board of Wages and Working Conditions was appointed which has been largely responsible for the supplemental orders on wages, and this board includes in its members C. E. Lindsay, a director of the A. R. E. A., who was formerly division engineer of the New York Central at Albany.

While the Railroad Administration availed itself of the services of engineers early in the period of government control in connection with capital expenditures, it was not until quite late in the season that any steps were taken to centralize the supervision of maintenance of way. On July 1, following the organization of the

Southwestern region, E. A. Hadley, chief engineer of the Missouri Pacific, was appointed engineering assistant to B. F. Bush, director of the Southwestern region, this being the first recognition of the necessity for an officer of this kind in the regional organizations. The great step for the unification of the administration of maintenance was not taken until late in August, when Mr. Morse was given supervision over maintenance work throughout the entire country. Other regional maintenance officers were appointed about the same time to serve in advisory capacities under the regional directors and as a committee under the chairmanship of Mr. Morse on matters of national import. It is a significant fact that all of these regional maintenance officers with one exception are members of the American Railway Engineering Association. This list includes G. J. Ray, engineering assistant to the director of the Eastern region; E. B. Temple, engineering assistant to the director of the Allegheny region; J. E. Crawford, engineering assistant to the director of the Pocahontas region; H. R. Rodenbaugh, engineering assistant to the director of the Southern region, and Mr. Safford and Mr. Hadley, previously mentioned.

In addition to those members of the association specifically mentioned above as carrying out certain particular branches of the work of the Railroad Administration, quite a few of the members were retained individually for certain specific activities of a diversified nature that are incapable of definite grouping. This list includes the following: L. W. Baldwin, operating assistant to the regional director of theAllegheny region; A. T. Hardin, assistant regional director, Eastern region; Howard Elliott, member Joint Fuel Zone Committee; H. B. Spencer, chairman, Advisory Committee, purchasing section; Major Edward C. Schmidt, Fuel Conservation Section; A. W. Gibbs, member committee on mechanical standards, division of operation; W. J. Cunningham, manager, operating statistics section; S. S. Roberts, staff officer, engineering, Southern region; G. D. Brooke, on staff of regional director, Allegheny region, and Lester Bernstein, on the taff of the regional director, Eastern region.

The A. R. E. A. Elects Officers

SHORTLY BEFORE the close of the afternoon session yesterday, Secretary Fritch announced the results of the balloting for officers for the ensuing year. The selection was as follows:

President, Earl Stimson, general superintendent maintenance of way, Baltimore & Ohio, Baltimore.

First vice-president, H. R. Safford, engineering assistant to regional director, Central Western region, Chicago.

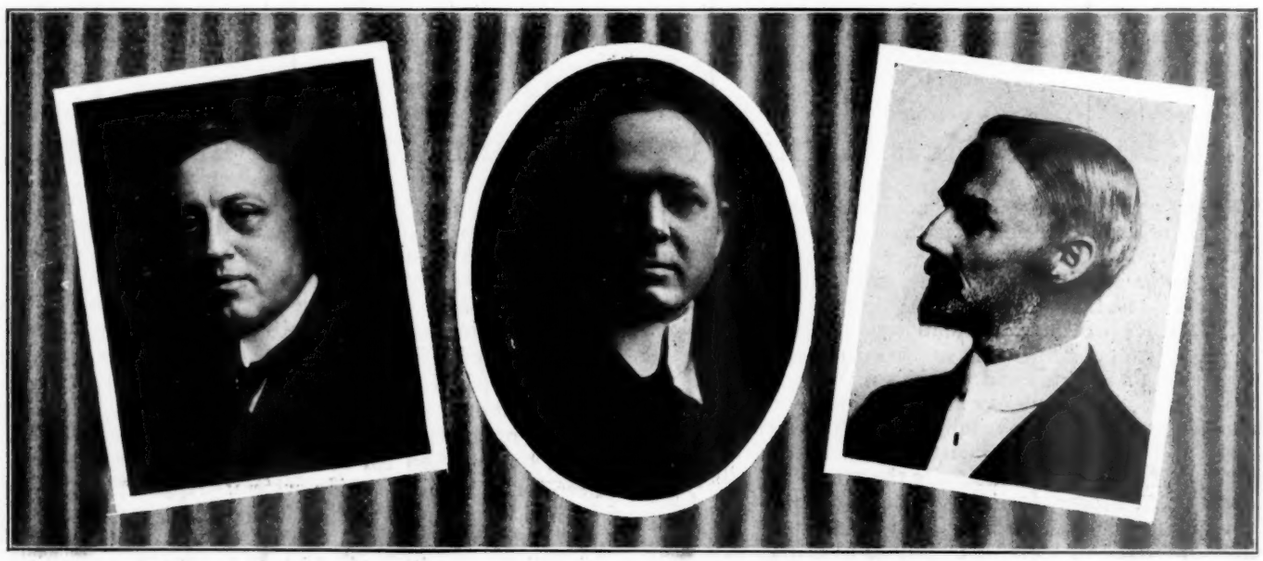
Second vice-president, J. A. Atwood, chief engineer, Pittsburgh & Lake Erie, Pittsburgh.

Treasurer, George H. Bremner, district engineer, Division of Valuation, Interstate Commerce Commission, Chicago.

Secretary, E. H. Fritch.

Directors, Charles F. Loweth, chief engineer, Chicago, Milwaukee & St. Paul, Chicago; F. L. Thompson, chief engineer, Illinois Central, Chicago; Hadley Baldwin, assistant chief engineer, Cleveland, Cincinnati, Chicago & St. Louis, Chicago.

Nominating Committee, C. F. W. Felt, chief engineer, Atchison, Topeka & Santa Fe, Chicago; G. J. Ray, chief engineer, Delaware, Lackawanna & Western, Hoboken, N. J.; J. R. W. Ambrose, chief engineer, Toronto Terminal Railway, Toronto, Ont.



Officers of the American Railway Engineering Association
Earl Stimson, President
H. R. Safford, First Vice-President **J. A. Atwood, Second Vice-President**

Earl Stimson, President

Earl Stimson, the new president of the American Railway Engineering Association, is not a rolling stone. Nevertheless he has gathered no moss on his back. While his entire engineering experience has been accumulated in the course of the long period of employment with a single railway system, the Baltimore & Ohio, this fact has not curtailed his development into an engineer of broad views capable of appreciating the problems to be encountered under a wide variety of conditions.

As regards his relations with others he is of a quiet, retiring demeanor, ungiven to advertising his own merits, and above all extremely conscientious with regard to facts. This trait of his character can be illustrated no better than by relating the following incident: About six months ago there appeared in these columns a sketch

of his career, published in connection with the announcement of his appointment to the position of general superintendent maintenance of way and structures. This sketch contained an error as will be noted from the following excerpt from a letter received from Mr. Stimson: "I wish to call your attention to the fact that there is one mis-statement, which I would be very glad, indeed, to have you correct, and that is with reference to my graduating from Cornell University in 1895. While I attended Cornell University in 1893, 94 and 95, I did not graduate, and although I would consider it a great honor to graduate from that institution, I do not care to seemingly assume that honor unearned."

He is a hard worker and is universally liked by his men. His long years of service are the best proof of his ability, as the position of engineer maintenance of way is most tedious and not only requires the exercise of engineering ability but also a capacity for handling detail. He is also head of an interesting family, consisting of his wife and six children.

Mr. Stimson was born at Cincinnati, O., on September 2, 1874. He was educated at Cincinnati University and attended Cornell University during 1893, 94 and 95. He entered railway service in June, 1905, as a rodman in the maintenance of way department of the Baltimore & Ohio Southwestern, with headquarters at Cincinnati. In 1896 he was promoted to assistant engineer, being transferred to Chillicothe, Ohio, in 1898. In 1899 he was promoted to resident engineer of construction, with headquarters at Osgood, Ind., where he remained until 1901, when he was advanced to the position of assistant division engineer at Chillicothe. His promotion to division engineer took place in April, 1902, when he was placed in charge of the engineering work of the Springfield division at Flora, Ill. He was transferred to Washington, Ind., in May of that year where he remained until 1905, when he was made engineer maintenance of way of the Baltimore & Ohio Southwestern. A further promotion to the position of chief engineer maintenance of way of the Baltimore & Ohio was given him in April, 1910. The title of this position was changed to engineer maintenance of way in 1912, and he held this position until August, 1918, when he was made general superintendent of maintenance of way for all lines grouped with the Baltimore & Ohio Eastern Lines, under the jurisdiction of C. W. Galloway, federal manager.

The Service Record of the Appliances Association

ALTHOUGH THE National Railway Appliances Association is essentially a cold, businesslike organization, composed of companies banded together for the purpose of exhibiting railroad appliances to the proper representatives of the various railroads, the personality of the companies constituting this association is in reality the spirit of its existence. The personality of these component parts is in turn dependent upon the character of their executives and the men in their respective employ. Hence a story of the National Railway Appliances Association in the war is the history, or service records, of its members.

The war records of the past year have served to a large extent to classify all humanity and endeavors into those that did and those that didn't. The National Railway Appliances Association did. The various railroad supply firms which constitute the association did. And in turn the men forming these companies did. This is the record in general.

The National Railway Appliances Association, being an intangible thing with a list of officers and directors and a treasury substantial but once a year before the annual exhibit and as regularly emptied a few weeks later after the close of the exhibit, could consequently do its bit as an association only by purchasing an allotment of Liberty Loan Bonds by dint of stringent economy. The records of the association's companies and the individual record of their employees is a record, too, of the N. R. A. A.

The contributions of different companies to the winning of the war may be expressed in terms of their blue and gold starred service flags, the records of their purchases of Liberty Bonds, their contributions to the various charitable organizations and the converting of their producing plants to the filling of government contracts for war materials. Unfortunately, no record has been kept of the war activities of members of the association nor have many of these activities been published during the past year, nevertheless, bits of their work are brought to light in their annual statements, in the reports of the charitable organizations and now, with the relinquishing of many plants from war material fabrication in the return of these plants to the production of their usual products.

A few examples of the war records of the railway supply trade firms will suffice to show the character of the assistance rendered the government during the period of hostility.

The Chicago Bridge & Iron Works, Chicago, of which M. J. Trees, president of the National Railway Appliances Association, is vice-president, has turned its three plants to the making of war materials for the government to the exclusion of its own products. Its service flag contains 183 stars and among those who have made enviable records in the service of the government are George P. Horton, president, who was assistant general manager of the Submarine Boat Corporation until January, 1919; Robert Murray, vice-president and manager of operation, who is now a lieutenant-colonel in the 21st Engineers, 77th Division, a part of the Army of Occupation, and Charles S. Pillsbury, assistant general sales manager, who is now overseas in the Construction Department of the Signal Corps.

The Manganese Track Society, when the need arose for standards for special track work for use on the railways which the United States forces in France had taken over, assisted S. M. Felton, director general of railways of the United States army, in their preparation, A complete set of standards for special track work, including frogs, switches, crossings and crossovers, was developed and the magnitude of the requirements is indicated by the fact that 5,000 turnouts alone were specified in the first order. A. H. Mulliken, president of the Manganese Track Society, and other members of the society were actively engaged in this work.

As stated before, these examples illustrate the work that members of the N. R. A. A. have done as their bit. Practically every member of the association could boast of a similar record and to enumerate them would be to simply repeat with slight modifications. Of special interest in connection with the work of the railway supply companies is the history of the Railway Regiments Tobacco Fund, instituted in October, 1917. The list of contributors to this fund to provide "smokes" for the members of railway regiments in France is replete with the names of N. R. A. A. firms. No doubt, if lists of the contributors to other funds of a similar nature were compiled the N. R. A. A. would have an equally good representation.

Of the men prominent in the association, several were not content with being the man behind the gun and entered active service. For instance, George C. Isbester, a member of the board of directors of the National Railway Appliances Association and district sales agent of the Rail Joint Company, Chicago, entered the navy in June, 1917, with the rank of lieutenant-commander and acted as paymaster at the Great Lakes Naval Training Station, with headquarters in Chicago. For many years Lieut. Commander Isbester has been a member of the Naval Reserve. He served in this capacity until July, 1918, when he was assigned to more active duty on the staff of Admiral Sims in London. Word recently received from him indicates the possibility of his early return to Chicago.

Tom R. Wyles, prominent for the past ten years as either an officer or a member of the board of directors of the National Railway Appliances Association, entered the Quartermaster Corp of the United States army in May, 1917, with the rank of captain and was stationed at Madison Barracks, N. Y. He resigned from the army in September, 1917, to become director of the Central district of the Military Training Camps Association, with headquarters at Chicago. This association under Mr. Wyles' direction came to be recognized as the best means of obtaining proper material for officers fitted to serve in the army during the emergency. Army authorities were at first skeptical of the efficiency of this plan, but before the signing of the armistice complete recognition had been given to Mr. Wyles' committee and its jurisdiction extended to the examining and recruiting of men fit to become officers in all branches of the army. Much of the credit for the success of this plan is attributed to his efforts.

Among other men prominent in the N. R. A. A. and who have been actively engaged in war work are Fred A. Poor and Fred A. Preston, president and vice-president, respectively, of the P. & M. Company of Chicago. Mr. Poor for three months from September to December, 1918, was assistant director of personnel of the American Red Cross at the American Red Cross headquarters in Washington, in which position he had charge of the selection of Red Cross workers for overseas duty and also the representatives of the American Red Cross in the United States. Mr. Preston was commissioned as captain in the Air Service of the Signal Corps in October, 1917, and sailed for France in the same month. There he was stationed in Paris and connected with the Supply Section of the Air Service of the American Expeditionary force, being commissioned a major before his return to the United States in December, 1918. He received his honorable discharge at Washington on December 29, 1918.

Soon after the declaration of war, Warren R. Roberts of the firm of Roberts & Schaefer, Chicago, was commissioned a major in the construction division of the United States army, in which work he was identified with the building of several of the large cantonments in the United States. Later in 1918 he was promoted to the rank of lieutenant-colonel and attached to the Purchases, Stores and Traffic Division of the General Staff, with headquarters at Washington.

Facts concerning the activities of individuals connected with the N. R. A. A. are hard to obtain and doubtless there are many men whom the older members of the association will remember as having been actively engaged in government work and whose records have never been chronicled. A summary of the work of these men would be highly interesting yet almost impossible to obtain at the present time. Others of whom notice has been received of their entry into active service are: Azel Ames, Jr., of the Kerite Insulated Wire Company, and until a few weeks ago a major in the 63d Regiment of Coast Artillery, stationed at Fort Screven, Savannah, Ga.; C. H. Wilson, St. Louis railway representative of Fairbanks, Morse & Co., and formerly a first lieutenant in the Tank Corp; T. E. Carthers and C. M. Deardorff, formerly sales engineers with the General Railway Signal Company, N. Y.; R. P. Johnson, assistant engineer, with the General Railway Supply Company of Canada at Lachine, Que.; E. A. Warner, Jr., of the Union Switch & Signal Co.; Captain John M. Taylor, formerly with the H. K. Ferguson Company of Cleveland, Ohio; Major O. F. C. Randolph, with the same company, who has been an officer in the 16th Engineers (Railway) in France since August, 1917; Lieutenant Sherman C. Amsden, formerly sales manager of the Mudge & Co., Chicago, and now assistant to president of the same company; Lieutenant W. W. Glosser, who has been associated with the P. & M. Company and the Madden Company, both at Chicago, and Captain A. Fletcher Marsh, of the Marsh-Truman Lumber Company, Chicago, who was connected with the Lumber Production Division at Washington.

The Railway Engineering Association in the War

THE HONOR ROLL of the American Railway Engineering Association contains the names of 137 members who joined the armed forces of the United States, Canada or Great Britain. Coming as they did from a body of men whose training and experience fitted them especially for leadership and technical attainment, the service rendered by this group of men proved invaluable in the various lines of special activities to which they were assigned. Nor is the record of the association to be judged by mere number of its roll of members who joined the colors, for with repeated admonition regarding the extreme importance of transportation at home as a part of the military machine there is no question but that many of the members were deterred from action which their patriotism prompted by the demands made upon them for service in this country. Be that as it may, there is no substitute for the sacrifices of military service. The men who suffered loss of position and home and income to serve their country deserve special recognition to which no others can lay claim.

Two members of the association made the supreme sacrifice. Lieut. Colonel Hiram J. Slifer, who died in France, will be remembered by his many warm friends and it is with no little satisfaction that we present on another page of this issue some detailed information concerning his military service and the accident leading to his death, together with some notes on the last days of his life.

The first member to die in the service of his country was Capt. Louis Vincent Manspeaker, who died of pneumonia on February 9, 1918, while in training at Camp Lee, Va. Capt. Manspeaker had been commissioned on January 1, and was expecting early assignment to active service on the other side at the time of his death. He was buried with military honors at his old home in Champaign, Ill. Before his entrance into the service he had been an assistant engineer on the Chicago & Alton, with headquarters at Bloomington, Ill. His previous railway experience extended to the Missouri, Oklahoma & Gulf and the Madeira-Mamore Railway of Brazil. Capt. Man-

speaker was an engineer of ability, energy and high regard for duty. He had a pleasing personality that won him many devoted friends, who keenly felt the loss occasioned by his death.

The most conspicuous service rendered by any member of the association and which will go down in history with greatest emphasis is that of S. M. Felton, director general of military railways, whose energy, resourcefulness and wide knowledge of railway matters, coupled with his executive ability in organizing railway troops and assembling and forwarding railway supplies, were largely responsible for the success of the American railway transportation system in France. The remarkable feature of Mr. Felton's military career is the fact that he carried on the great work in close contact with the military establishment in the capacity of a civilian, for he persistently refused to accept a commission.

Linked with Mr. Felton's name is that of William J. Wilgus, who was a member of the commission that went to France in May, 1917, to investigate the transportation needs of the American expeditionary forces. Later he collaborated with Mr. Felton in determining the equipment requirements and upon the perfection of a permanent organization was given a commission as colonel in the capacity of senior deputy to Brig. General W. W. Atterbury, the director general of transportation, in the Services of Supply.

It is interesting to note that seven other members of the association were officers in Gen. Atterbury's organization. In this number were included all three engineers of construction, namely, Col. H. C. Booz, now corporate chief engineer of the Pennsylvania Railroad; Col. H. M. Wait, formerly city manager of Dayton, Ohio, and Lieut. Col. A. W. Hudson, formerly engineer of construction on the Hell Gate bridge. Others on this list are Maj. W. M. Vandersluis, signal engineer of the military railways, who was formerly signal engineer of the Illinois Central; Lieut. Col. B. L. Bugg, one of the general superintendents, formerly general manager of the Atlanta, Birmingham & Atlantic; Col. F. W. Green, one of the port terminal superintendents and formerly assistant to the president of the St. Louis-Southwestern, and Lieut. Col. E. B. Cushing, director general of army transport service, who was formerly assistant general manager in charge of the maintenance of way department on the Sunset Central Lines.

Later Col. Cushing saw service in Italy and more recently with an important American commission appointed by Gen. Pershing for service in the Rhine valley, the North sea ports and other points where the possessions of the allies come in contact with the states of the German republic. In addition to the men mentioned above who were identified with the transportation forces of the Services of Supply, not a few members of the association were, and many of them still are, connected with various other branches of the service in important positions. Some of them, like Col. George H. Webb, formerly chief engineer of the Michigan Central, and Col. J. F. Jonah, who has recently returned to his position as chief engineer of the St. Louis-San Francisco, were officers in the various railway regiments organized early in 1917 to form a portion of the advance guard of the American troops that landed in France early after the declaration of war.

Some facts concerning Col. Jonah's experience are mentioned here as illustrating the nature of the services performed by American railway men in military activities somewhat more remote from railroad work than that connected with the operation of the military lines under the Services of Supply. Commissioned as a major on January 23, 1917, he was ordered into active service with the 12th Engineers in June, and landed at Liverpool on August 12, taking part in the memorable parade of the four engineer regiments in London on August 15. Upon landing in France he was immediately assigned to duty back of British lines in Picardy on the location and construction of light railways serving the British. On October 17 he was detached from the 12th Engineers and appointed chief engineer, Department of Light Railways for the American Expeditionary Forces. This service occupied the greater part of the winter of 1917 and the early months of 1918 and involved the examination of trains, light railway systems, shops, etc., on the front from Verdun to the Swiss border, in addition to considerable construction work. In September 10, 1918, he was promoted to the rank of lieutenant-colonel and when the signing of the armistice removed the necessity for any further construction of light railways he was relieved from active duty and returned to the United States, where he arrived in January, 1919.

An account of this kind must not be restricted to men who were in the United States army. Among Canadian members who distinguished themselves in the war is Col. C. W. P. Ramsey, C. M. G., of the Canadian Overseas Railway Construction Corps, who was a member of the first construction battalion to leave Canada.

This organization left Canada in June, 1915, and after some time in England reached France in August. It was later attached to the English army and was engaged in all manner of railway construction work. The corps distinguished itself especially during the retreat in the spring of 1918, being turned into demolition parties to destroy the lines of communication in the face of the German advance. Col. Ramsey was awarded the C. M. G. (Commander of the Order of St. Michaels and St. George) and was promoted to colonel in April, 1917. Before entering military service he was engineer of construction of the Canadian Pacific and in association affairs was identified with the work of the committee on Economics of Railway Location. Colonel Ramsey has returned to Canada and has resumed his duties with the Canadian Pacific.

Maj. F. L. C. Bond, recently made chief engineer of the Grand Trunk, saw extended service in France. F. W. Thornton, general manager of the Great Eastern Railway of England, was commissioned a brigadier-general in the British army and served in a capacity somewhat analogous to that of Gen. Atterbury in the American army.

Fifty Millions to Railroad Administration

(*Special Telegram to the Railway Age*)

WASHINGTON, D. C., March 19, 1919.

"The War Finance Corporation has loaned fifty million dollars to the Railroad Administration, which is to be used to replenish working capital in the hands of Federal treasurers to meet current requirements. One of these is for a large number of cross ties now being received, which are to be paid for on delivery. A large number of Federal treasurers have been in Washington this week. This sum represents all that the Administration itself can get from the War Finance Corporation, although individual railroad companies may make loans."

Wood Preservers Change Convention Date

Owing to the fact that the Automobile Show will be held in Chicago during the fourth week of January, 1920, the Executive committee of the American Wood-Preservers' Association, at a meeting held in the Auditorium hotel yesterday, decided to postpone its convention two weeks. It will, therefore, meet at the Hotel Sherman, Chicago, the second week in February.

Railroad Administration Closes Contracts

The Railroad Administration executed compensation contracts on Tuesday with the Salina Northern for $15,000; the Louisville, Henderson & St. Louis for $343,915, and the Louisville & Nashville for $17,310,000.

Baltimore & Ohio Luncheon

Engineering officers of the Baltimore & Ohio held a get-together luncheon at the Congress hotel yesterday, which was attended by about 55 members of the eastern and western organizations. L. G. Curtis, corporate engineer, Baltimore & Ohio, presided and a number of those present responded to toasts.

Concrete Freight Car on Exhibition

A freight car with reinforced concrete floor, sides and ends has been designed and patented by Joseph B. Strauss, president of the Strauss Bascule Bridge Company, Chicago, and is on exhibition at the Central Station, at 12th St. and the Illinois Central tracks, during the convention. The first car built to this design was placed in service with appropriate ceremonies on Monday.

Roadmaster's Committee Meeting

The members of the Executive committee of the Roadmasters' and Maintenance of Way Association spent most of yesterday at a meeting in the Auditorium hotel, planning for the next convention. The work of the committees was reviewed and other problems facing the association were discussed.

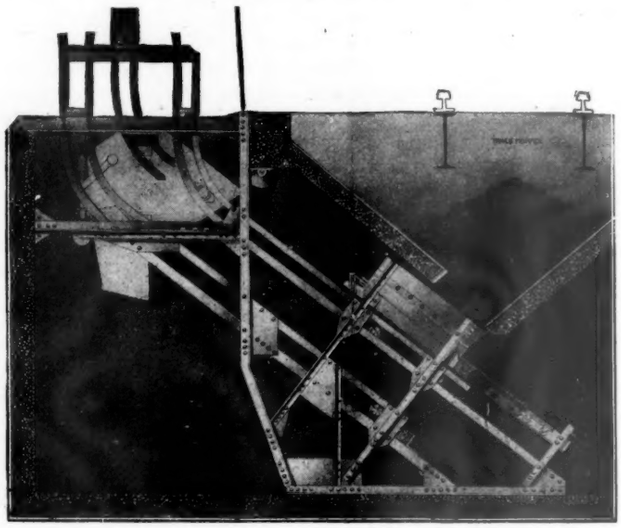
Correction

The statement was made in our Daily Edition on March 19 that General Petain had bestowed the French Croix de Guerre with two palms on Sergeant William N. Lepreau, son of Frank Lepreau, vice-president of Thomas A. Edison, Inc., Primary Battery Division. This statement was incorrect with respect to the bestowal of this honor by General Petain, as he confers such honors on commissioned officers only.

A New Development in Coaling Station Design

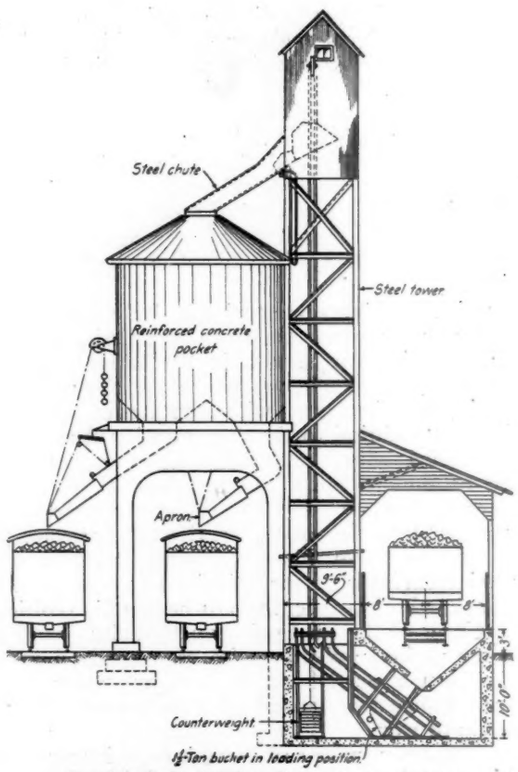
THE COUNTERBALANCED bucket has been recognized for years as one of the most economic and efficient methods of hoisting coal. It has one disadvantage, however, the necessity for a deep pit placed beside the track hopper; that is, it is necessary to have a pit deep enough so that the coal deposited in any part of the track hopper pit will reach the bucket in a well adjacent to one side of the pit in addition to the vertical height occupied by the bucket itself. Whenever difficult foundation materials are encountered in the construction of a pit of this kind, the cost of a substructure for the station may be excessive.

To meet the needs of difficult situations of this kind coaling plants have been built in which the coal was delivered to the hoisting bucket by means of an incline from a hopper under the center of the track pit at an angle of about 30 deg. from the horizontal. This plan necessarily involves the use of a separate feeding bucket with its added operating and maintenance costs. To eliminate this extra feature the Roberts & Schaefer Co., Chicago, has perfected and patented the design and construction of a shallow pit counterbalanced bucket for handling coal from the track hopper to storage, this design being known as the "RandS" shallow pit elevating bucket. In this design the hoisting bucket, instead of



Enlarged View of the Incline Under the Track Hopper

descending into a pit vertically below the hoisting tower, passes down an incline to a point underneath the track hopper, where the coal may be received through a gate direct from the hopper. After receiving its load of coal



Sectional End Elevation of the Station

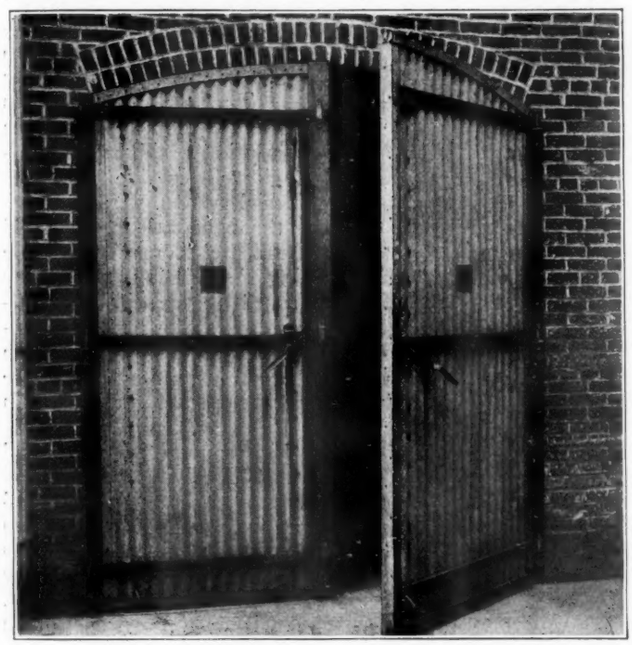
from the track hopper the bucket starts upon its upward journey along the incline, drawing with it the undercut gate until the aperture from the track hopper is completely closed when the gate is released and the bucket

continues on an incline until clear of the track hopper, as shown in the cut. At this point in the bucket travel, the ball-bearing rollers which guide the bucket in its vertical travel gradually glide into their guides and the rollers which guided the bucket in its inclined travel become disengaged. The bucket continues on its vertical travel until it comes to the top of the plant, where the apron is released, allowing the bucket to discharge its load.

A Recent Development in Fire Doors

THE IMPORTANCE TO railroads of fire prevention and control is annually evidenced in the reports of the Railway Fire Protection Association. In a recent report of this Association the fact was disclosed that the average annual loss to railroads from fires closely approximates $7,000,000. In buildings one of the principal methods for the prevention and control of fire is in the installation of fire doors in the division walls.

The photographs shown with this article are two of many types of fire doors manufactured by the Merchant & Evans Company of Philadelphia, Pa. These types are particularly applicable to railroad structures. The hinged doors operate with non-automatic hardware, but if desired automatic hardware may be used. The sliding door shown is, of course, automatic.

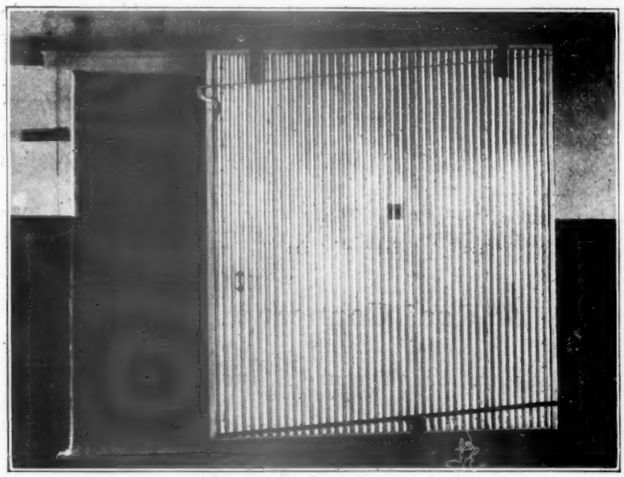


Hinged Fire Doors

In construction the doors shown and other types manufactured are similar. Essentially they consist of a double panel of heavy corrugated galvanized steel, lined with sheet asbestos and bound in a rigid, continuous frame of 3/16-in. by 2½-in. bar steel. The frame is reinforced on all edges by an extra heavy binder of galvanized steel, forming a box for the panel and thus preventing damage to it. Provision is made for expansion and contraction, so that distortion and warping of the door is impossible and the radiation of heat is reduced to a minimum by means of a series of regular air spaces, properly insulated, covering the entire area of the door.

The absence of a wood core reduces the weight of the doors, the average weight being not more than 5 lb. per sq. ft. The absence of wood or other material subject to deterioration reduces maintenance charges to the minimum and the heavy steel binder on the edges prevents damage to the frame from trucking.

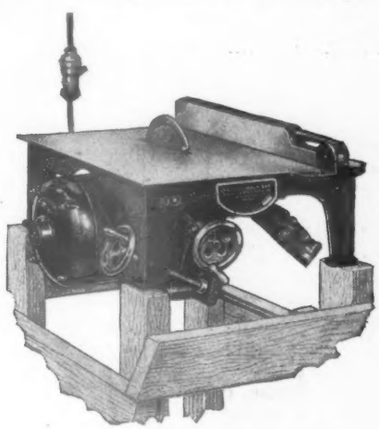
While these fire doors and fire shutters have been on the market but a short time, they are in use extensively by railways, including the New Haven, the Pennsylvania and the Reading.



Sliding Door of Automatic Type

Bench Saw for Woodworking Shops

A PORTABLE BENCH SAW, so designed that the saw can be raised or lowered and tilted to any angle up to 45 deg. with the table always remaining in a horizontal position, has recently been placed on the market. This machine is adapted for use in carpenter, cabinet and pattern shops.



Electric Driven Portable Saw

It can be operated on an electric light circuit still maintaining sufficient power to take a 2-in. cut through hardwood, making it possible to utilize it on at least 80 per cent of ordinary carpenter work. By its portable feature the time ordinarily lost in taking material from the bench to a saw located some distance away is saved.

The table is 17 in. by 20 in. and the saw is 7 in. in diameter. The saw may be tilted by means of a hand wheel and screw on the side of the machine. It is driven through cut gears from a ½ hp. motor fitted with a ball bearing to take up the thrust when the saw is tilted for

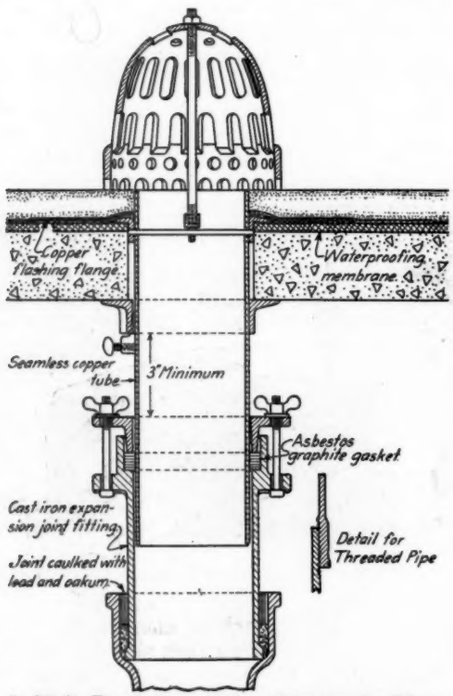
cutting at an angle. The advantage of this method of tilting over the ordinary tilting table is apparent, especially in cutting long stock which may be done without danger of breaking the angle by the stock coming in contact with the floor. The saw may be raised or lowered so as to cut or groove any depth up to 2 in.

The cross cut frame is adjustable to a 45-deg. angle and is an integral part of the machine, being swung under the table when not in use. The rip fence is of the box type and is clamped to the table by means of an eccentric lock. It is finished on both sides so that it may be used on either side of the saw. The saw is protected by a shutter guard which is held in place by a spring but slips back as the stock is fed into the machine.

This saw is a recent addition to the line of bench machines manufactured by J. D. Wallace & Co., Chicago.

A Roof Connection Fixture

THE MOST EXPENSIVE and carefully placed roofing is of little value if the connections of the roof or roofing to the outlets for vents and down spots are faulty or develop defects during service. Especially serious conditions arise when down spouts which occasionally carry a considerable volume of water are carried down inside the building. On source of trouble with such roof connections is the settlement of the building, or the expansion and contraction of the riser pipe which tends to destroy the union between the roofing and the



A Holt Roof Connection Fixture in Place

flanges of the roof connection, or even pull apart the riser pipe at the joints.

One means designed to overcome difficulties of this kind is the Holt roof connection, handled by the Barrett Company, New York. Since its introduction several years ago several modifications of this device have been developed so that it has been made applicable to a variety of conditions and roof details. The essential feature of this device is a slip joint in the pipe, formed by a special asbestos graphite gasket surrounding a copper tube. In some designs this slip joint forms a part of the roof connection itself, but in others it is located in a separate fitting just under the roof. The latter form is of more general application and is illustrated in the drawing. This shows the arrangement for a concrete roof or floor, but other arrangements provide for other forms of roof and roofing.

It will be seen in the drawing that a section of copper tubing is connected to the roof or floor by means of a flanged fitting and is covered with a cast iron strainer. The lower end of this tube fits into a special cast iron expansion joint. This fitting is arranged to connect at its lower end with bell and spigot cast iron pipe or with screw pipe, while its upper end provides the slip joint with the copper tube. The type of roof connection shown is available in 3-in., 4-in., 5-in., and 6-in. diameter pipes and other types are to be had in diameters as great as 8 in. Instruction sheets are issued which show how the joints may be applied to various forms of construction.

Value of Special Rail Inspection Demonstrated

THE MANUFACTURER of a particular device, the inventor of a special design, or the originator of some particular method of doing a piece of work, all strive for opportunities to demonstrate the particular efficiency of their own methods or devices as compared to those produced by others. But as a rule results are only comparative and it is not often that conclusive statistics may be compiled which demonstrate the proposition in actual figures. As a striking exception to this rule the officers of Robert W. Hunt & Co. have been able to demonstrate the advantages of the special system of rail inspection instituted by this company through statistics compiled by others, namely, the rail statistics compiled by the American Railway Engineering Association. As these statistics show the results secured on the different railroads for the different makes and ages of rails it is a simple matter to segregate the statistics covering rails known to have been rolled under the special inspection from those rolled without it and compare the results secured from both classes.

Comparisons prepared in this manner from the rail failure statistics published in 1918, giving the returns on rails rolled in the United States in the five years 1913 to 1917, inclusive, give some interesting results. In brief they show that there were 30 per cent more failures per 100 miles of track laid with rails that did not receive the special inspection than on those which did have it. These comparisons are summarized in the table given below:

OPEN HEARTH STEEL ONLY—RAILS MADE IN U. S. ONLY

Total track miles reported	37,862.33
Total track miles covered by special inspection	17,154.65
Per cent of miles reported covered by special inspection	45.3
Number of failures per 100 track miles (all rails)	31.13
Number of failures per 100 track miles covered by special inspection	26.67
Number of failures per 100 track miles not covered by special inspection	34.83

To those unfamiliar with the nature of special inspection the following explanation defines the difference between so-called "special" inspection originated by Robert W. Hunt & Co., and what may be termed the ordinary inspection.

"Special inspection is, in short, inspection applied to the whole process of manufacture, while ordinary inspection consists especially of an examination of the finished rails to prove the accuracy of the section rolled, the me-

chanical finish and the final classification into first or second quality, etc., while, of course, the physical tests specified are also given attention. Special inspection, whereby inspectors are located in all important parts of the mill during manufacture, is supplemental to ordinary inspection and obviously requires the employment of more inspectors than does ordinary. Generally speaking, the actual number of men employed on special inspection is three times that of ordinary, but this feature depends on mill conditions and especially on its size and tonnage."

A Recent Type of Air Dump Car

AN AIR DUMP CAR in which the locking and unlocking and the position of the bed of the car are controlled absolutely by air without the use of side chains and without any fixed connection between the bed and the underframe

Automatic Compression Lock Type

has recently been introduced by the Western Wheeled Scraper Company of Aurora, Ill., for use in classes of work where it is desirable to employ cars without side chains. The dumping and righting of the bed are accomplished by the use of two short, vertical cylinders, one on each side of the car, so placed that their piston rods engage with the underside of the bed through hinged connections, called push rod extensions. The strut or post is hinged at its bottom end to the body bolster. Its upper end moves in a guide attached to the floor of the car, so that the motion of the strut is controlled positively.

Type of Air Dump Car Used by the A. E. F. in France

To lock the car in the carrying position, a brace has been pivoted at the upper end of each strut which the lower end engages with a cam fastened to a rack shaft, which in turn is operated by the movement of the piston in the cylinder. By this method all the parts between the bed and the frame are in compression.

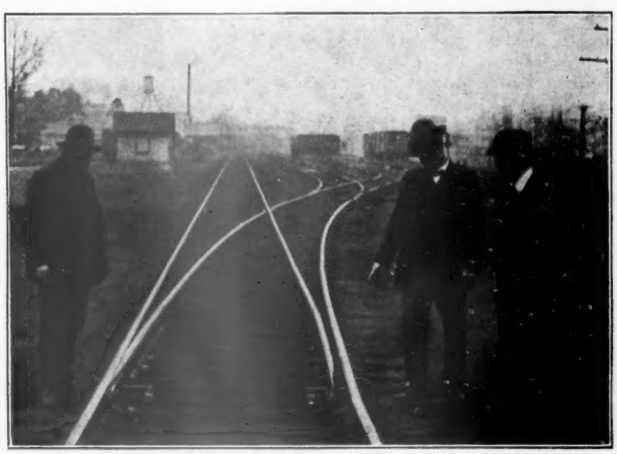
By engaging directly with the bottom of the car, the piston rods utilize the total power of the air pressure in the cylinders in dumping or righting the car, thus eliminating all losses due to cables and sheaves. The thrust of the piston is applied near the outer edge of the car bottom, giving the greatest possible leverage and reducing the amount of power needed.

This simplified form of dumping device has also been applied to cars fitted with side chains for controlling the position of the bed. This type of car was used extensively in war construction in France, where nearly 1,000 have been supplied. It is furnished in four sizes, 12-yd., 16-yd., 20-yd. and 30-yd. capacity.

The Morrison Switch Point Hold Down

A DEVICE WHICH IS SAID to insure an easy throwing switch while at the same time always holding it in surface and eliminating all vertical motion in the points has recently been introduced by the Deeming-Endsley Company of Chicago. The device is known as the Morrison switch point hold down and consists of 4 parts; two attaching clamps which fit over any standard switch plate, a bolt, and a horizontal guide rod 1 in. in diameter, which is secured at one end to the attaching clamps, extends through a hole 1⅛ in. in diameter, drilled in the web of the switch point and turns up under the ball of the running rail.

It is applied readily, the work consisting of drilling a hole in the web ¼ in. above the flange and 18 to 21 in. from the toe of the point; then the plate is raised on the inside of the point and a slot ½ in. deep is made in the



The Switch Point Hold Down in Service

tie the width of the attaching clamps; the lower lips of the clamp are then set under both sides of the tie plate and the curved end of the horizontal rod is inserted in the switch point and the other end is pressed down until it rests on the upper lips of the clamps. The application of the bolt completes the operation except for driving a small spike in a slot provided in the clamp to hold the rod firmly against the rail. These spikes permit of adjustment of the device as required.

Although this device has been on the market but a comparatively short time it is in extensive use on steam roads. Among the roads using the device are the Dallas Union Terminal, the Kansas City Southern and the Gulf, Colorado & Santa Fe. It is claimed for the device that it prevents derailments at switches and insures additional life to switch points.

Some New Pipe Threading Tools

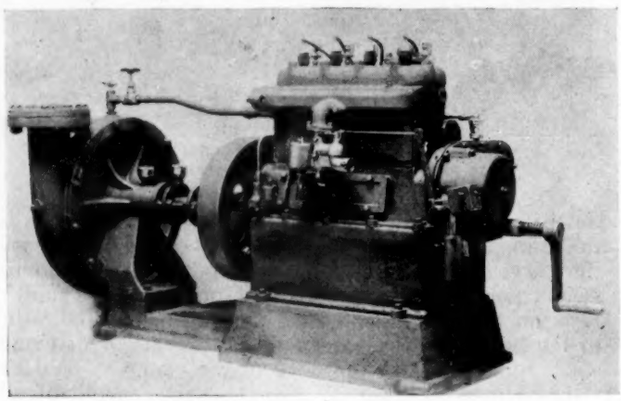
A NEW RATCHET-HANDLED pipe cutter with quick changing units for different sizes of pipe is a convenient tool recently developed for working in tight places on pipes ranging from ⅛ in. to 1 in. in size. The device is also applicable to bench work. As shown in the illustration, it consists of a series of six die heads of ⅛-in., ¼-in.,

The Ratchet Handle and the Six Die Heads

⅜-in., ½-in., ¾-in. and 1-in. size, which are fitted into a socket containing a ratchet and also fitted with a handle. These heads can be changed quickly and have bosses on the sides that engage slots in the sides of the socket to keep them from turning independent of the socket. The ratchet is completely inclosed so that it is readily kept free from dust and grease and also eliminates possible loss of any loose parts. This device is manufactured by the Borden Company, Warren, Ohio, and is known as the No. 3 Beaver Junior ratchet.

Pumping Outfit for Railway Water Supply

IN ITS UNIVERSAL TYPE F centrifugal pumping outfit designed for use in railway installations where a full head capacity is desired the University Motor Company of Oshkosh, Wis., has made a practical application of a gasoline motor direct connected to a centrifugal pump. The outfit has a capacity of 265 gal. per min. with a 55-ft. head. The important feature of this plant is the fact that the engine is designed and constructed to operate continuously with practically no attention or trouble. It will pump 150,000 gal. in a 10-hr. day, with a fuel consumption of about 9 gal. of gasoline. It is of the four-cylinder balanced type capable of operating at a normal speed of 1,000 r. p. m. It has a removable cylinder head,



A Full-Head Three-Inch Centrifugal Pumping Outfit

high tension ignition, automatic oil pump and generator, all parts being enclosed and running in oil.

The governor controls the speed, holding it to 1,000 r. p. m. regardless of the load, so that the water can be shut off at any time without adjusting the engine. The cylinders are 2⅝ in. by 4 in. and the crank shaft has a diameter of 1½ in. and adjustable bearings. All the small parts are hardened steel, ground to interchangeable size.

The oil pump is of the plunger type, taking oil from the base and pumping it through the sight feed glass in the gear. The oil flows from this point to all interior parts, automatically lubricating them. It is removable by dismounting the discharge pipe union.

The engine is fitted with an Atwater-Kent ignitor or magneto and is wired up complete with spark plugs when shipped. The pump has a 3-in. discharge and a 4-in. suction and is equipped with a ball thrust bearing to take the end thrust of the runner. It is connected to the engine fly wheel by means of an arm coupling. The pump can be fitted with a foot valve so it may be primed.

A Cylindrical Telephone Booth

A CONCRETE TELEPHONE BOOTH of cylindrical form has been developed recently as a substitute for the square or hexagonal shapes more commonly used in the past and over which it is said to have a number of advantages. The idea in developing this design was to supply the demand for a moderate priced booth of perma-

Two Views of the Booth

nent construction that can be transported readily, and will not be damaged when being shifted from place to place. As seen in the illustration, the booth consists essentially of a section of concrete pipe of three feet inside diameter with holes cut for a door and (if desired) for windows. The conical roof is cast separately and fits down over the cylindrical body.

Both the barrel and the roof are designed for the stresses occurring during transportation and erection. Owing to the cylindrical shape of the barrel of the booth, rolling is a most convenient method of moving it about. The booth has no floor since there seems to be a demand for a house in which a cinder floor can be placed. When used as a sentry box two windows are provided, but these are ordinarily omitted when it is used as a telephone booth and when used for this purpose a hole of one inch diameter is provided in the back for the entrance of a telephone cable and a ring is inserted in the roof to hold the slack in the cable. This type of concrete booth was developed and is being manufactured by the C. F. Massey Company, Chicago.